PILOT KNOB ROAD (CSAH 31) CORRIDOR STUDY

STUDY REPORT

MAY 2013

Prepared for:
Dakota County
City of Eagan

Prepared by:
Bolton & Menk, Inc.
T42.105105

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CERTIFICATION

I hereby certify that this report was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota

By: _____

Christopher S. Chromy, P.E., P.T.O.E.
License No. 26512
Bolton & Menk, Inc.

Date: May 31, 2013

INTRODUCTION

Pilot Knob Road (CSAH 31) begins in Farmington, runs the entire length of the City of Eagan in northern Dakota County and continues to Mendota Heights (see **Figure 1**). In the area of northern Eagan, the corridor is a four-lane county highway. The City of Eagan's 2030 Comprehensive Plan outlines a vision for the Central Commons area, an area surrounding the intersection of Pilot Knob Rd and Yankee Doodle Road and I-35E. The Pilot Knob Road corridor through northwest Eagan is currently a corridor in transition. The plan identifies this as an area of community focal point; an integrated mixed-use place serving as a destination for shopping, dining, living, working and recreating. The community has been focused on shaping development in the Central Commons areas for over 15 years due to its location and convenient transportation access. The east side of Pilot Knob Road just north of Yankee Doodle Rd is currently developed with existing commercial (restaurant, hotel, bank, Learning Center, senior living, etc.) and office land uses. There is interest in the redevelopment of the former Lockheed Martin site, located on the west side of Pilot Knob Rd in this area, into a large-scale commercial/retail development.

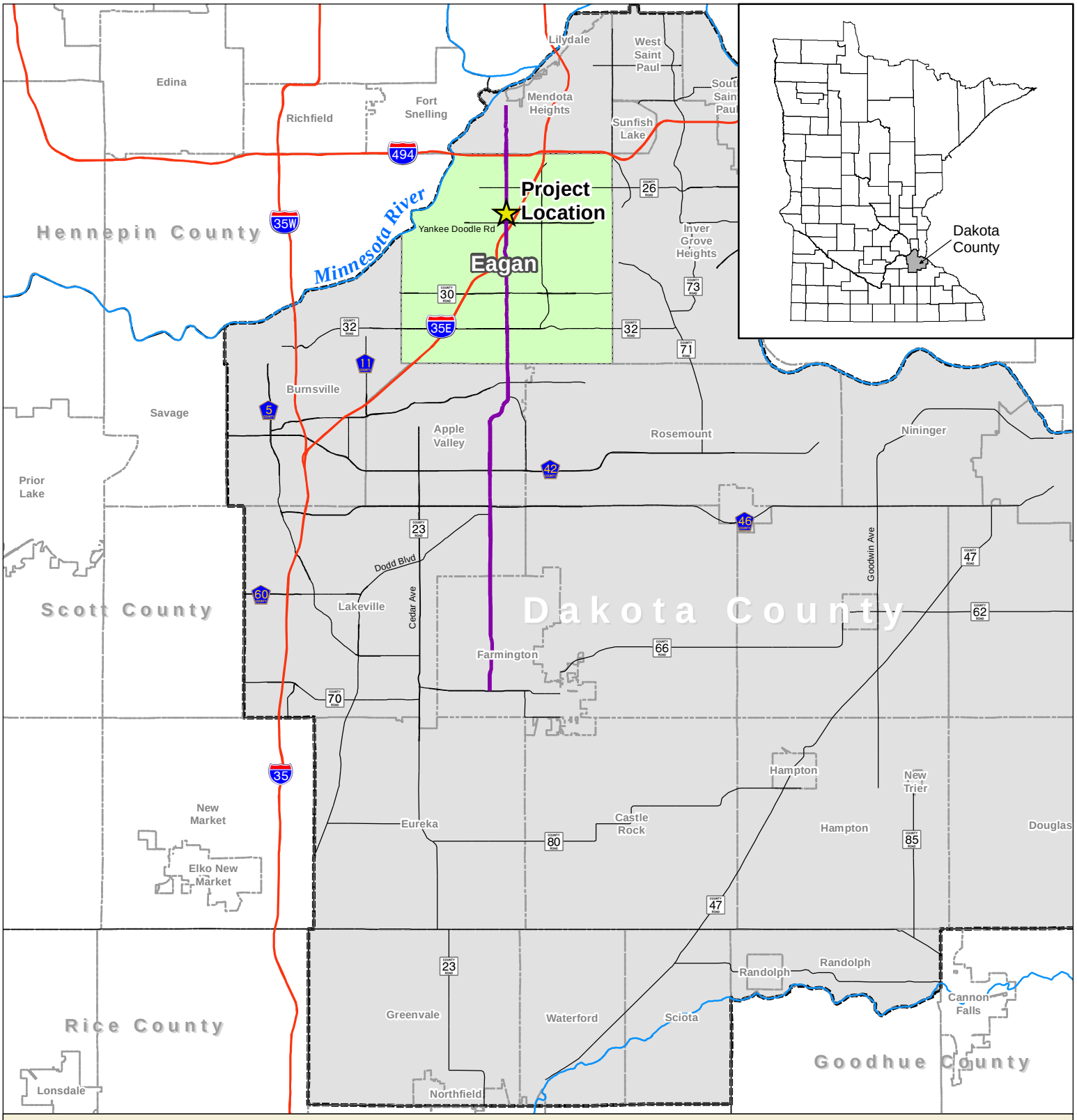
Traffic queuing on Pilot Knob Rd between Yankee Doodle Road and Central/Northwood Parkway are currently causing long delays at intersections, particularly on side-streets. The lack of available gaps for traffic to cross the roadway is resulting in U-turns and other maneuvers due to the lack of gaps and mainline southbound queues. The lack of turn lanes and gaps have resulted in safety concerns and crashes in this area and are primarily the result of the close spacing of intersections, the lack of local road connections adjacent to the Pilot Knob Rd corridor and traffic levels in this area. Due to these existing traffic operational and safety issues and the potential large-scale redevelopment in this area, Dakota County and the City of Eagan initiated a study to identify access, safety and mobility needs along Pilot Knob Road in this area. **Figure 2** depicts the area of Pilot Knob Rd under study, between Yankee Doodle Rd and Central Parkway/Northwood Parkway.

STUDY PURPOSE

The purpose of the study is to identify a long-term improvement plan for Pilot Knob Rd between Yankee Doodle Rd and Central Parkway/Northwood Parkway to address existing traffic operational issues and safety concerns along with a plan to accommodate traffic growth in the area.

The key elements of the Pilot Knob Road Corridor Study are to:

1. Document the need for improvements, which may include:
    a. Capacity improvements
    b. Access modifications
    c. Local street connections
    d. Median installation and additional lanes or turn lanes
    e. Intersection control changes
2. Identify corridor concepts
3. Select a recommended corridor improvement plan
4. Develop an implementation plan



2650 Feet

Legend

- Pilot Knob Rd
- Trunk Highway
- Municipal Boundary
- River

Source: Dakota County, MnDOT

City of Eagan

Dakota County

PILOT KNOB CORRIDOR STUDY

Project Location

Figure 1

October, 2012

BOLTON & MENK Engineers & Surveyors

Map Document: \\Arcserver1\gis\DACO\T42105105\ESRI\Maps\105105- Project Location 85 x11.mxd
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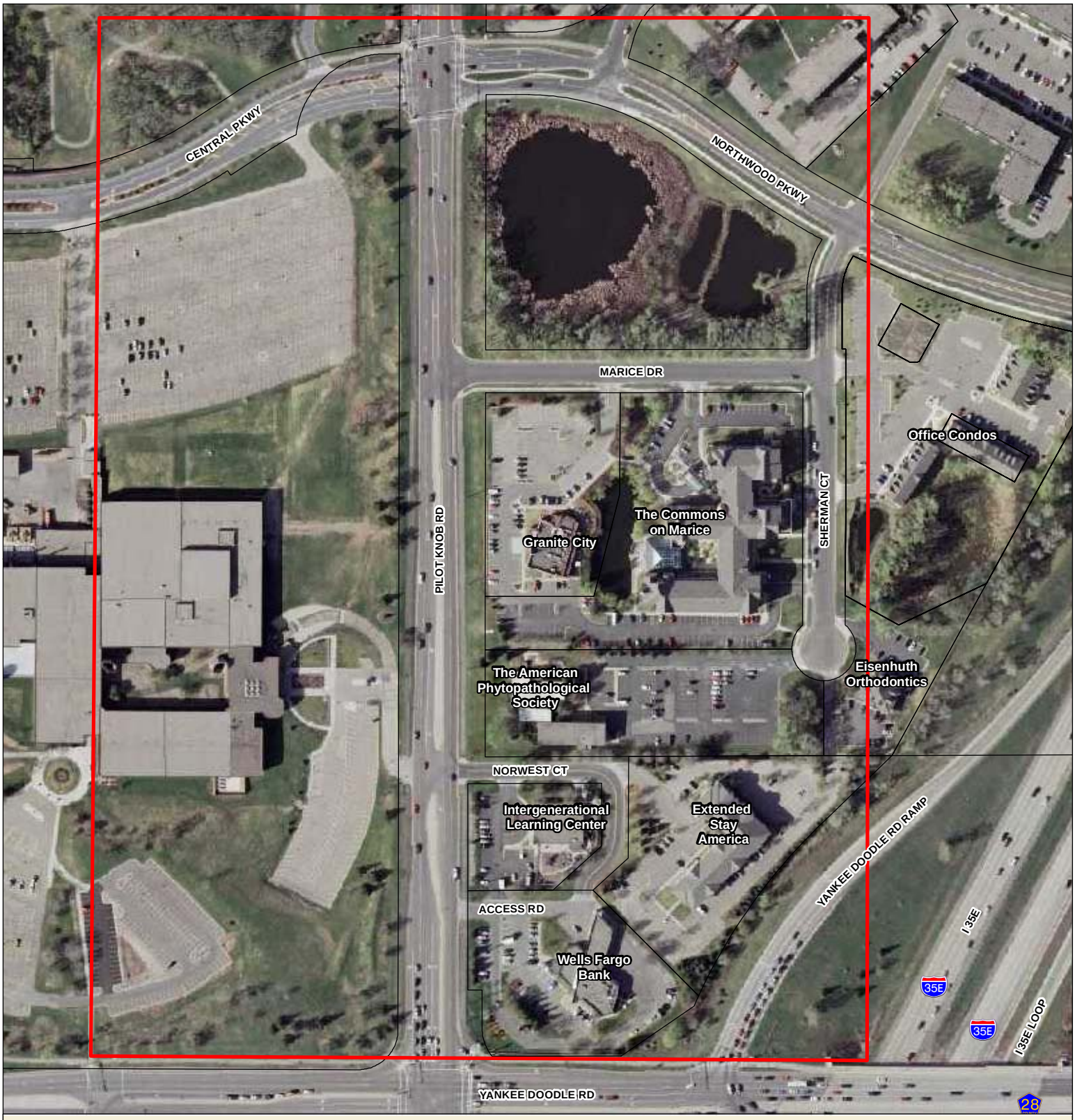

City of Eagan

Dakota County

BOLTON & MENK Engineers & Surveyors

Legend

- Study Area
- Parcels

Source: Dakota County, MnDOT

PILOT KNOB CORRIDOR STUDY

Study Area

Figure 2

October, 2012

Map Document: \\Arcserver1\gis\DACO\T42105105\ESRIMaps\105105- Study Area 85 x11.mxd
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AGENCY PARTICIPATION AND PUBLIC INVOLVEMENT

This study was conducted by Bolton & Menk, Inc., with oversight, public involvement participation and direction provided by a Project Management Team (PMT). The PMT included representatives from Dakota County and the City of Eagan.

Appendix A includes a listing of the PMT meetings and PMT members.

STAKEHOLDER MEETINGS

Individual meetings with property/business owners and developers were held throughout all phases of the study. The purpose of these meetings was to solicit input on key issues, needs and opportunities and to gather input on proposed roadway improvement concepts. A small-group meeting was setup in July 2012 to introduce the study and gather input on issues, needs and concerns within the study area. Only CSM representatives (former Lockheed Martin site developer) and a Dakota County Commissioner attended the initial meeting. Therefore, in order to ensure involvement of all area businesses, County and City staff reached out to individual property owners and businesses with one-on-one and small-group meetings. Stakeholders and area residents were also invited to attend the September 5, 2012 and November 5, 2012 public open house meetings for additional opportunities to review study information and provide input. A log of all public involvement meetings held throughout the course of the study is included in **Appendix B**.

OPEN HOUSE

A public open house was held on September 5, 2012 to share the purpose of the study, present existing conditions information and solicit input on the initial range of improvement concepts being considered. A second public open house was held on November 5, 2012 to provide an opportunity for the public and property/business owners to comment and provide further input on the Draft Preferred Alternative. A summary of the comments received at each of the open houses are included in **Appendix C**.

WEBSITE

Dakota County hosted a project website for the Pilot Knob Road Corridor Study. Study documents and public involvement notices were posted on the website at key milestones throughout the study.

BACKGROUND INFORMATION

PREVIOUS STUDIES

Several recent studies and/or plans were utilized in the development of the Pilot Knob Road Corridor Study. These include:

- City of Eagan Comprehensive Plan Update 2030 – This plan provides 2030 traffic forecasts for the city roads within the study area, including Central and Northwood Parkway. The plan also provides a guide to future land use along the Pilot Knob Road corridor.

- Dakota County 2030 Transportation Plan and County Resources– The Dakota County 2030 model provides 2030 traffic forecasts for Pilot Knob Road. The Dakota County Plat Review Needs map denotes Pilot Knob Road as a six-lane need from south of Diffley Road (CSAH 30) to south of Central/Northwood Parkway. The County's access management guidelines are included in the Dakota County 2030 Transportation Plan.

- Lockheed Martin Site Redevelopment Traffic Analysis (2012) – This traffic study evaluated existing roadway conditions, future traffic and subsequent traffic impacts to the adjacent roadway network from the proposed Lockheed Martin site redevelopment, and recommended any necessary improvements.

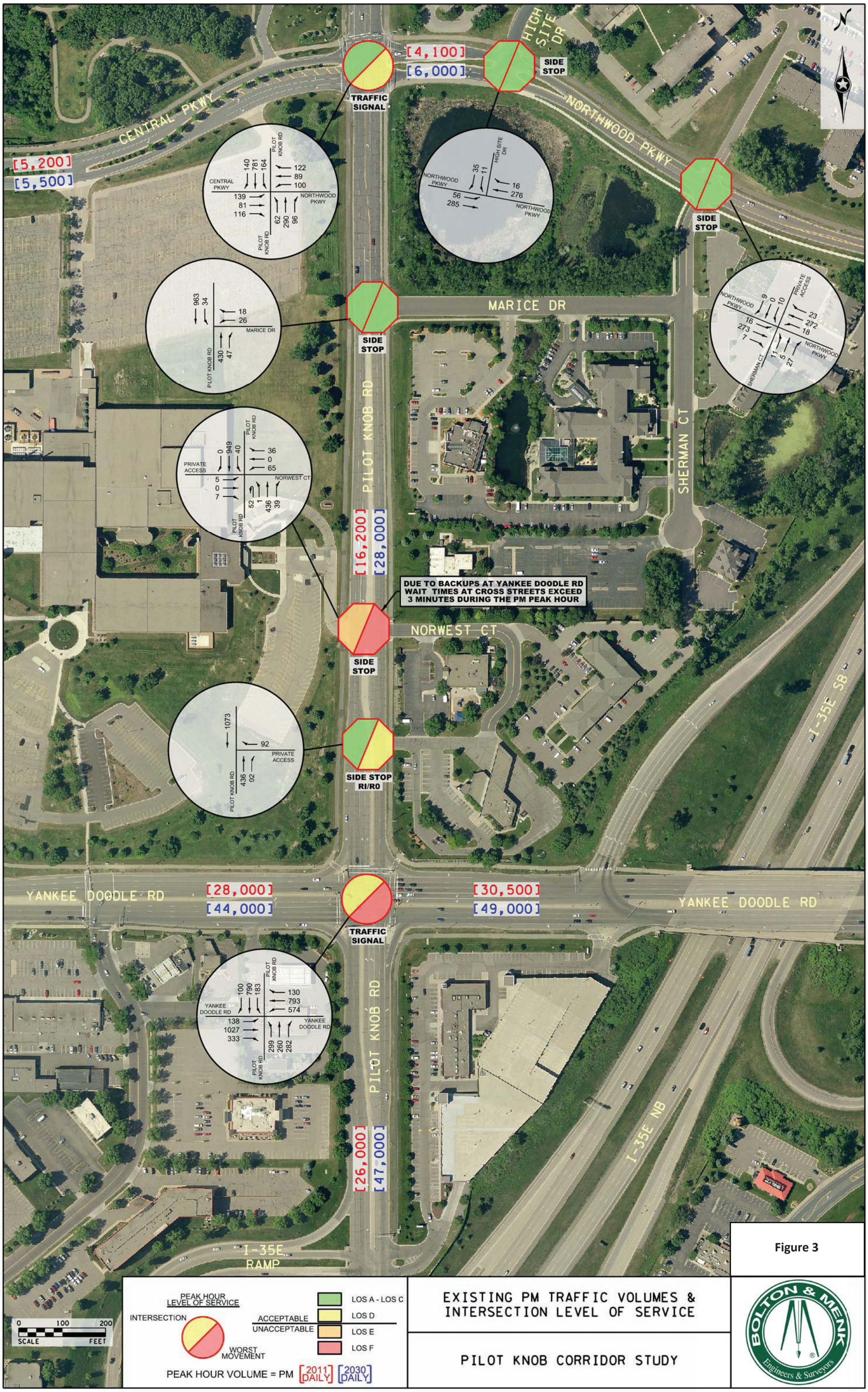
TRAFFIC AND ROADWAY CHARACTERISTICS

DATA COLLECTION

With the recent conclusion of the Lockheed Martin Site Redevelopment Traffic Analysis (March 2012), much of the existing traffic conditions data was already available. However, there were three key intersections adjacent to or on the corridor that were not part of the previous analysis but were important to the corridor study effort in terms of evaluating access concepts. Therefore, the intersections of Northwood Parkway with Sherman Court and High Site Drive, and Pilot Knob Road with the Wells Fargo Access Road were collected. PM peak hour turning movement counts were collected June 12-14, 2012 during a three-hour window each day from 3:30 to 6:30 PM.

In order to determine how traffic is currently operating in the study area, a traffic operations analysis was completed for existing conditions at several key intersections within the study area. **Figure 3** presents the data and level of service results for these intersections. The analysis focused on the intersections along Pilot Knob Rd in the study area plus the intersections of High Site Dr and Sherman Ct with Northwood Pkwy. Findings of the data collection analysis include:

- The Yankee Doodle Rd and Pilot Knob Rd intersection operates near capacity during the PM peak hour
- Motorists on the side-street approach of Norwest Court at Pilot Knob Rd are experiencing significant delays (over three minutes) during the PM peak hour
    - The poor operations are caused by southbound queues from the Yankee Doodle Rd and Pilot Knob Rd intersection extending beyond Norwest Court
- Many U-turns were recorded during the PM peak hour at the Norwest Ct/Pilot Knob Rd intersection from motorists making a right turn at the Wells Fargo driveway. While the U-turn


CENTRAL PKWY
[5,200]
[5,500]
TRAFFIC SIGNAL
[4,100]
[6,000]
HIGH SITE DR
SIDE STOP
NORTHWOOD PKWY
SIDE STOP
MARICE DR
SIDE STOP
PILOT KNOB RD
[16,200]
[28,000]
DUE TO BACKUPS AT YANKEE DOODLE RD WAIT TIMES AT CROSS STREETS EXCEED 3 MINUTES DURING THE PM PEAK HOUR
NORWEST CT
SHERMAN CT
SIDE STOP
SIDE STOP RI/RO
I-35E SB
YANKEE DOODLE RD
[28,000]
[44,000]
[30,500]
[49,000]
TRAFFIC SIGNAL
YANKEE DOODLE RD
I-35E NB
[26,000]
[47,000]
I-35E RAMP
CENTRAL PKWY
PILOT KNOB RD
NORTHWOOD PKWY
HIGH SITE DR
MARICE DR
PILOT KNOB RD
PRIVATE ACCESS
NORTHWOOD PKWY
PRIVATE ACCESS
NORWEST CT
PILOT KNOB RD
YANKEE DOODLE RD
YANKEE DOODLE RD
PILOT KNOB RD
0 100 200
SCALE FEET
PEAK HOUR LEVEL OF SERVICE
INTERSECTION
WORST MOVEMENT
ACCEPTABLE
UNACCEPTABLE
LOS A - LOS C
LOS D
LOS E
LOS F
PEAK HOUR VOLUME = PM [2011 DAILY] [2030 DAILY]
EXISTING PM TRAFFIC VOLUMES & INTERSECTION LEVEL OF SERVICE
PILOT KNOB CORRIDOR STUDY
BOLTON & MENK Engineers & Surveyors
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jacobbo

Figure 3

can be a reasonable maneuver, here it takes precedence over left turns at Norwest Ct and add greater delay at this street intersection.

- All of the other intersections within the study area operate acceptably under existing conditions.

SAFETY ANALYSIS

The safety analysis for this study used Mn/DOT[1] crash data for five years (2007 through 2011). The analysis focused on the same key intersections considered in the traffic operations analysis. The results of this safety analysis are shown on **Figure 4**. The Pilot Knob Rd/Norwest Ct intersection displayed a slightly higher crash rate than the Metro District average for similar intersections. All of the other intersections studied had crash rates lower than the Metro District average for similar intersections. A fatal crash was reported at the Marice Dr intersection with Pilot Knob Road in 2008.

The majority of crashes occurring along the corridor are right-angle crashes that take place during peak traffic periods when limited gaps are available at Marice Drive and Norwest Court, the full access unsignalized intersections on the corridor. The Pilot Knob Road corridor displays an overall safe environment for both motorists and pedestrians with exception to the slightly elevated crash rate at Norwest Court and 2008 fatality at Marice Drive.

ASSESSMENT OF EXISTING ACCESSES

Access Management Guidelines

Pilot Knob Road is an A-Minor Arterial roadway in Dakota County. The highway corridor through the study area has greater access than the County's access management guidelines recommend for an arterial roadway of this type. The Dakota County Transportation Plan's access management guidelines for a roadway such as Pilot Knob Rd denotes one full access intersection for every ½ mile (2,640') interval and limited street connections with partial access between the major intersections.

Existing Pilot Knob Road Access Spacing

As illustrated in **Figure 3**, the existing access intersection spacing on Pilot Knob Rd in this area ranges from 260' to 735', much less than the desired 2,640' full access spacing. Within the area between Yankee Doodle Rd and Central/Northwood Parkway, four intersections on Pilot Knob Rd provide full movement access (openings in the median) to vehicles entering and exiting the public streets and private driveways. These are Pilot Knob Rd at Yankee Doodle Rd, Norwest Ct, Marice Dr and Northwood Parkway. The Wells Fargo Access Road and existing Lockheed Martin driveway provides a right-in/right-out access. The County's spacing recommendation of ½ mile, or 2,640', between primary full-movement intersections is not being met in the study area. This suggested spacing for a corridor such as Pilot Knob Road provides for mobility with well spaced traffic signals and adequate space for turn lanes.

Since the total distance between Yankee Doodle Rd and Central Parkway is 1,910', it is not feasible to fully meet the ½ mile (2,640') access spacing recommendations within the study area. However, the study goal is to identify an improvement concept that addresses the traffic operations and safety concerns occurring in the study area through a combination of capacity improvements, access modifications and/or local street improvements to improve safety and mobility while maintaining accessibility in the corridor.

[1] Minnesota Crash Mapping Analysis Tool (MnCMAT)

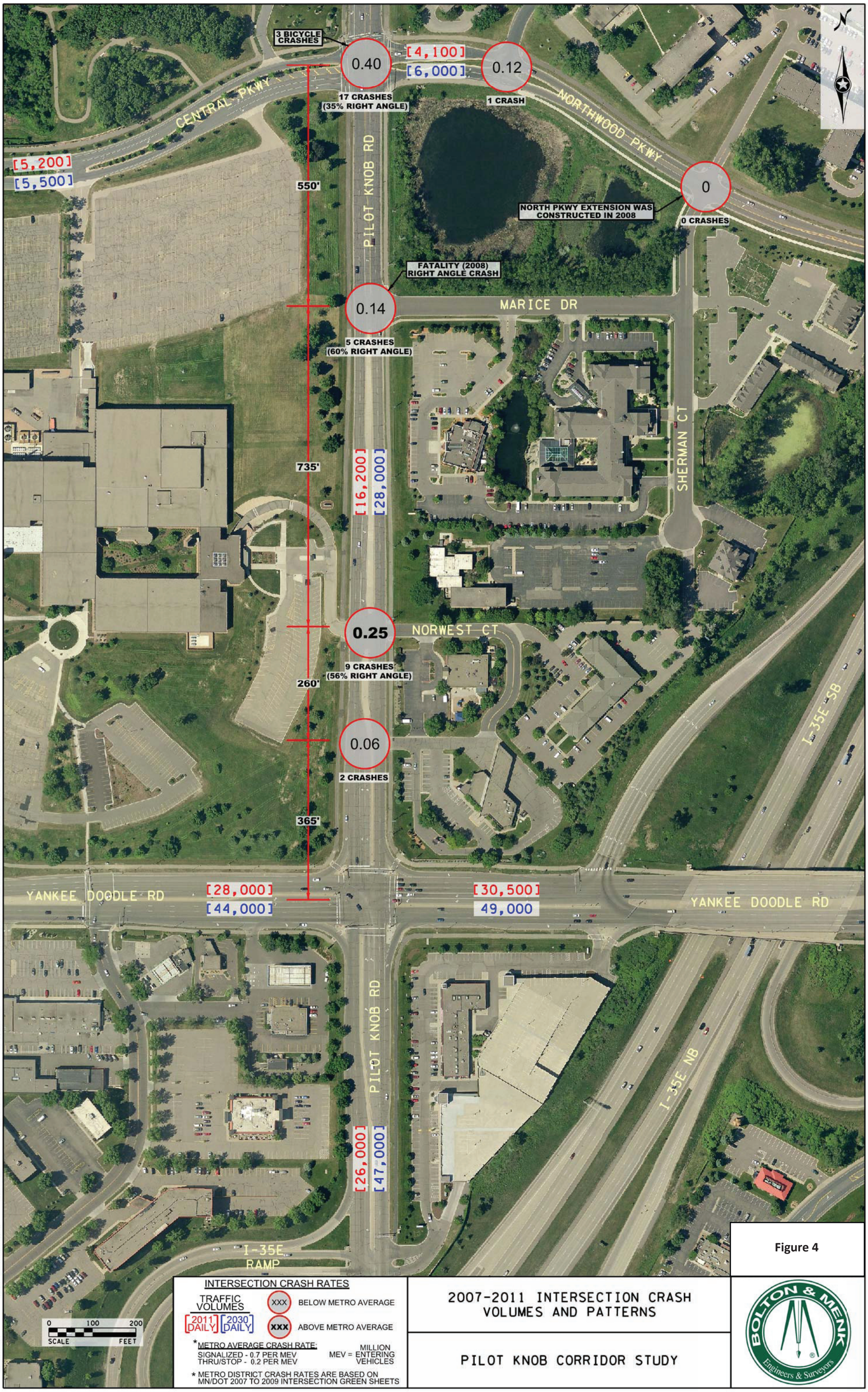

Figure 4

2007-2011 INTERSECTION CRASH VOLUMES AND PATTERNS

PILOT KNOB CORRIDOR STUDY

BOLTON & MENK Engineers & Surveyors

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PURPOSE AND NEED FOR IMPROVEMENTS

Based on the review of existing traffic and safety issues within the study area, the following purpose and need for improvements was defined.

PROJECT PURPOSE

The study is taking place to address safety and mobility issues on Pilot Knob Rd resulting from the close spacing of intersections, the lack of local road connections adjacent to the corridor and increasing traffic volumes within the area.

PROJECT NEED

OPERATIONS/MOBILITY

- Existing access spacing is very close which does not accommodate turn lanes. Traffic at side-stop intersections has trouble finding gaps in traffic. Spacing along the corridor:
    - Central Pkwy to Marice – 550'
    - Marice to Norwest – 735'
    - Norwest to Access Rd – 260'
    - Access Rd to Yankee – 365'
- Delays at Norwest Ct extend beyond 3 minutes in evening peak hour
- Queuing from Yankee Doodle Rd in evening peak extend through Norwest Ct intersection makes it difficult for traffic to turn on to Pilot Knob Rd
- Pilot Knob Rd northbound left-turn traffic at Central Pkwy periodically extends beyond the turn lane causing operation and safety concerns
- Traffic volumes on Pilot Knob and Yankee Doodle Rd are expected to grow
    - Pilot Knob – 16,200 (2011) to 28,000 (2030)
    - Yankee Doodle Rd – 30,500 (2011) to 49,000 (2030)
    - Intersection of Pilot Knob/Yankee Doodle Rd is one of the busiest in the County and it exceeds signalized capacity without ability to make additional improvements due to proximity to Interstate 35E.

SAFETY

- 33 crashes at intersections along corridor between 2007-2011
    - Central Parkway/Northwood Parkway – 17 crashes (35% right angle)
    - Marice Drive – 5 crashes (60% right angle)
    - Norwest Ct – 9 crashes (56% right angle)
    - Wells Fargo Access Road – 2 crashes
- Fatality at Marice Drive in 2008 (right angle crash)
- Norwest Ct intersection has crash rate higher than metro average (0.25 per million entering vehicles versus metro average 0.2 per million entering vehicles)

TRANSPORTATION VISION

ROADWAY IMPROVEMENT CONCEPTS

The Dakota County 2030 Transportation Plan provides 2030 traffic forecasts for Pilot Knob Road and the Dakota County Plat Review Needs Map identifies the need for a 6-lane corridor to address future capacity needs on Pilot Knob Road between Diffley Road (CSAH 30) and Central/Northwood Parkway. Through this study, a more detailed analysis was completed to better understand specific capacity needs along Pilot Knob Road between Yankee Doodle Dr and Central/Northwood Parkway. A primary need was identified and includes expansion of the southbound approach to the Yankee Doodle Road intersection including the addition of a third through lane and expanded left turn lane capacity. This expansion will address the overall need for a 6-lane corridor as described above and was included with all corridor concepts.

The remaining operational and safety issues along Pilot Knob Road are directly related to the location and spacing of intersections within this area. Therefore, the study improvement concepts in this area considered access modifications and/or closures to fully address corridor safety and operations. The study goal with respect to roadway access is to balance mobility with land use accessibility. The ideal solution would be to meet the County access guidelines while providing sufficient ability to access property while not overloading intersections. Given the difficulty in retrofitting the existing Pilot Knob Road corridor, a range of roadway improvement concepts were developed to address the project's purpose and need in the best manner, considering the existing conditions and capacity needs of the corridor.

The following is a summary of the key features of each improvement concept, information on how the concept addresses the purpose and need, and details of the associated impacts. It should be noted that each improvement concept adds a divided median through the corridor, a southbound through lane and right-turn lanes at all proposed intersection locations. To provide better pedestrian connections each concept also includes the completion of the off-road trail system on both sides of Pilot Knob Road within the study area.

CONCEPT A (BACKAGE ROAD BOTTOM)

Figure 5 illustrates Concept A which modifies and/or closes various access points along Pilot Knob Rd and provides a local road connection between Norwest Court and Sherman Court through the American Phytopathological Society's parking lot.

Purpose and Need Consideration

Operations/Mobility

- Improves access spacing by removing two full access intersections with safety and operational issues and creating a partial access (south of Marice – west side) and 2 right-in/right-out accesses (Norwest and Marice)
- Local street connection serves to support Pilot Knob Rd and connect east-side businesses to the full signalized access intersection at Northwood Pkwy/Central Pkwy
- Queues from Yankee Doodle Rd would not impact Norwest Ct operations due to the modification of Norwest to right-in/right-out
- All intersections projected to operate acceptably
- A partial access for the west side development is identified to provide connectivity and travel options

Safety

- Right-angle crashes anticipated to decrease at Marice and Norwest due to right-in/right-out access modification
- Wells Fargo Access Road closure will eliminate safety issue with unanticipated stops/slowing at this location and will accommodate a right turn lane to Norwest Court.
- All accesses have turn lanes to separate turning traffic from thru traffic (improves both safety and mobility)
- Shifting the eastbound left turn lane at Central Parkway will provide visibility for opposing left turns and will improve operations and safety

Impacts

- Requires major reconfiguration of American Phytopathological Society parking lot
- Minimal parking lot reconfiguration for Extended Stay America Hotel
- Maintains existing total number of parking spaces at all businesses
- Traffic signal revision at Central Parkway/Northwood Parkway will require widening and addition of a median at this location
- Requires right-of-way for some widening along the corridor for turn lanes and addition of a median

Preliminary Roadway Design
Concept A

PILOT KNOB RD

CLOSE

CENTRAL PKWY

DONEENE LN

JURDY RD

YANKEE DOODLE RD

NORWEST CT

INTERGENERATIONAL LEARNING CENTER

THE AMERICAN PHYTOPATHOLOGICAL SOCIETY

GRANITE CITY

WELLS FARGO BANK

MARICE DR

THE COMMONS ON MARICE

EXTENDED STAY AMERICA

YANKEE DOODLE RD RAMP

SHERMAN CT

NORTHWOOD PKWY

HIGH SITE DR

EISENHUTH ORTHODONTICS

OFFICE CONDOS

I-35E

LEGEND

- ROADWAY
- CONCRETE (MEDIAN / WALK)
- SIDEWALK
- LANDSCAPING

0 100 200

SCALE FEET

Figure 5

Pilot Knob Corridor Study
Dakota County, MN
August 2012

CONCEPT B (ROUNDABOUT)

Figure 6 illustrates Concept B which includes a multi-lane roundabout at Pilot Knob Road and Central/Northwood Parkway. Because of the roundabout's ability to effectively and safely facilitate U-turn movements, a local road connection was not included for providing access to Pilot Knob Road.

Purpose and Need Consideration

Operations/Mobility

- Improves access spacing by removing two full access intersections with safety and operational issues and creating two partial accesses (Marice and south of Marice –west side) and one right-in/right-out (Norwest Ct) to provide access to businesses
- Roundabout facilitates U-turn movements for businesses without a direct connection to Central Parkway, without the need for a local street connection
- Southbound Pilot Knob Rd traffic would be required to make a U-turn at Yankee Doodle Rd to access Norwest Ct
- A partial access for the west side development is identified to provide connectivity and travel options

Safety

- Right-angle crashes anticipated to decrease at Marice and Norwest due to the elimination of full access at these locations
- Wells Fargo Access Road closure will eliminate safety issue with unanticipated stops/slowing at this location and will accommodate a right-turn lane to Norwest Court.
- Roundabouts promote increased safety (fewer crashes and less severe crashes) compared to traffic signals
- Facilitates U-turns for all vehicles within the roundabout
- U-turns are safe and acceptable at protected left-turn signalized intersections
- All accesses have turn lanes to separate turning traffic from thru traffic (improves both safety and mobility)

Impacts

- No local street connection required (reduced cost/less right-of-way to business)
- No impacts to existing parking lots
- Requires some additional right-of-way for roundabout

Preliminary Roadway Design
Concept B

SOUTHERN MOST CSM ACCESS ℄

NORTHERN MOST CSM ACCESS ℄

≈ 400'

≈ 715'

INSCRIBED CIRCLE DIAMETER = 170'

CLOSE

CLOSE

PILOT KNOB RD

PILOT KNOB RD

CENTRAL PKWY

DONEENE LN

JURDY RD

YANKEE DOODLE RD

NORWEST CT

INTERGENERATIONAL LEARNING CENTER

WELLS FARGO BANK

THE AMERICAN PHYTOPATHOLOGICAL SOCIETY

GRANITE CITY

THE COMMONS ON MARIGE

EXTENDED STAY AMERICA

YANKEE DOODLE RD RAMP

EISENHUTH ORTHODONTICS

OFFICE CONDOS

NORTHWOOD PKWY

HIGH SITE DR

I-35E

LEGEND

- ROADWAY
- CONCRETE (MEDIAN / WALK)
- SIDEWALK
- LANDSCAPING

0 100 200

SCALE FEET

Figure 6

Pilot Knob Corridor Study
Dakota County, MN
August 2012

CONCEPT C (BACKAGE ROAD TOP)

Figure 7 illustrates Concept C which is similar to Concept A in terms of access modifications along Pilot Knob Road; however, the main difference is the location of the proposed local road connection between Norwest Ct and Sherman Ct. In Concept C this local backage road is located in closer proximity to the Extended Stay Hotel, on top of the existing retaining wall separating the hotel and the American Phytopathological Society property.

Purpose and Need Consideration

Operations/Mobility

- Improves access spacing by removing two full access intersections with safety and operational issues and creating one partial access (south of Marice – west side) and two right-in/right-out accesses (Marice and Norwest)
- Local street connection serves to support Pilot Knob Rd and connect businesses to the full access intersection at Northwood Pkwy/Central Pkwy
- Queues from Yankee Doodle Rd would not impact Norwest Ct operations due to the modification of Norwest to right-in/right-out
- All intersections projected to operate acceptably
- A partial access for the west side development is identified to provide connectivity and travel options

Safety

- Right-angle crashes anticipated to decrease at Marice and Norwest due to the elimination of full access at these locations
- Wells Fargo Access Road closure will eliminate safety issue with unanticipated stops/slowing at this location and will accommodate a right turn lane at Norwest Court
- All accesses have turn lanes to separate turning traffic from thru traffic (improves both safety and mobility)
- Shifting the eastbound left turn lane at Central Parkway will provide visibility for opposing left turns and will improve operations and safety

Impacts

- Minimal parking lot reconfigurations
- Maintains total existing number of parking spaces
- Building setback standards at Extended Stay America not met
- Traffic signal revision at Central Parkway/Northwood Parkway will require widening for turn lanes and addition of a median

Preliminary Roadway Design
Concept C

PILOT KNOB RD

CLOSE

CENTRAL PKWY

PILOT KNOB RD

PILOT KNOB RD CLOSE

NORWEST CT

DONEENE LN

JURDY RD

YANKEE DOODLE RD

INTERGENERATIONAL LEARNING CENTER

THE AMERICAN PHYTOPATHOLOGICAL SOCIETY

GRANITE CITY

WELLS FARGO BANK

MARICE DR

7' FROM BUILDING CORNER TO BACK OF CURB

THE COMMONS ON MARICE

EXTENDED STAY AMERICA

NEW RETAINING WALL

NORTHWOOD PKWY

YANKEE DOODLE RD RAMP

SHERMAN CT

HIGH SITE DR

EISENHUTH ORTHODONTICS

OFFICE CONDOS

I-35E

LEGEND

- ROADWAY
- CONCRETE (MEDIAN / WALK)
- SIDEWALK
- LANDSCAPING

0 100 200

SCALE FEET

Figure 7

Pilot Knob Corridor Study
Dakota County, MN
August 2012

CONCEPT D – FRONTAGE ROAD OPTIONS A AND B

Figures 8 and 9 illustrate Concept D. This concept was developed in response to input from CSM at the July 30, 2012 Property Owner Meeting in which CSM noted a desire to have a full centralized access. A full access does not meet the safety or mobility objectives of the study and therefore, a concept was developed that includes two partial access intersections to serve the former Lockheed Martin site west of Pilot Knob Rd and a realigned Norwest Ct east of Pilot Knob Road. It also includes two local frontage road options connecting Norwest Ct to Sherman Ct.

Purpose and Need Consideration

Operations/Mobility

- Removes two full access intersections with safety and operational issues and creates two partial accesses (former Lockheed Martin site and at realigned Norwest)
- Lockheed Martin site and realigned Norwest accesses maximize the spacing from Central Pkwy/Northwood Pkwy and Yankee Doodle Rd and accommodates left-turn lanes in both directions
- Relocation of access on east side of Pilot Knob Rd requires closure of Norwest Ct (no right-in/right-out accesses)
- Local street connection serves to support Pilot Knob Rd and connect businesses to the partial access at Norwest and the full access intersection at Northwood Pkwy/Central Pkwy
- Queues from Yankee Doodle Rd would not impact the realigned Norwest Ct operations due to the shifting of this intersection to the north and modification to a partial access
- All intersections projected to operate acceptably
- A partial access for the west side development is identified to provide connectivity and travel options

Safety

- Right-angle crashes anticipated to decrease at Norwest due to the elimination of full access at this location
- Wells Fargo Access Road closure will eliminate safety issue with unanticipated stops/slowing at this location and will accommodate a right turn lane to Norwest Ct
- Safety concerns with local road connection that splits the American Phytopathological Society's building with the majority of their parking lot *(Frontage Road Option A)*
- Off-set approaches to the intersection of Sherman Ct/New Norwest Ct may impact sight angles for drivers *(Both Frontage Road Options)*
- All accesses have turn lanes to separate turning traffic from thru traffic (improves both safety and mobility)
- Shifting the eastbound left turn lane at Central Parkway will provide visibility for opposing left turns and will improve operations and safety

Impacts

- Traffic signal revision at Central/Northwood Parkway will require some corridor widening for medians and left turn lanes *(Both frontage road options)*

Preliminary Roadway Design

Concept D Frontage Rd Option A

(Developed with input from CSM at July 30th Property Owner Meeting)

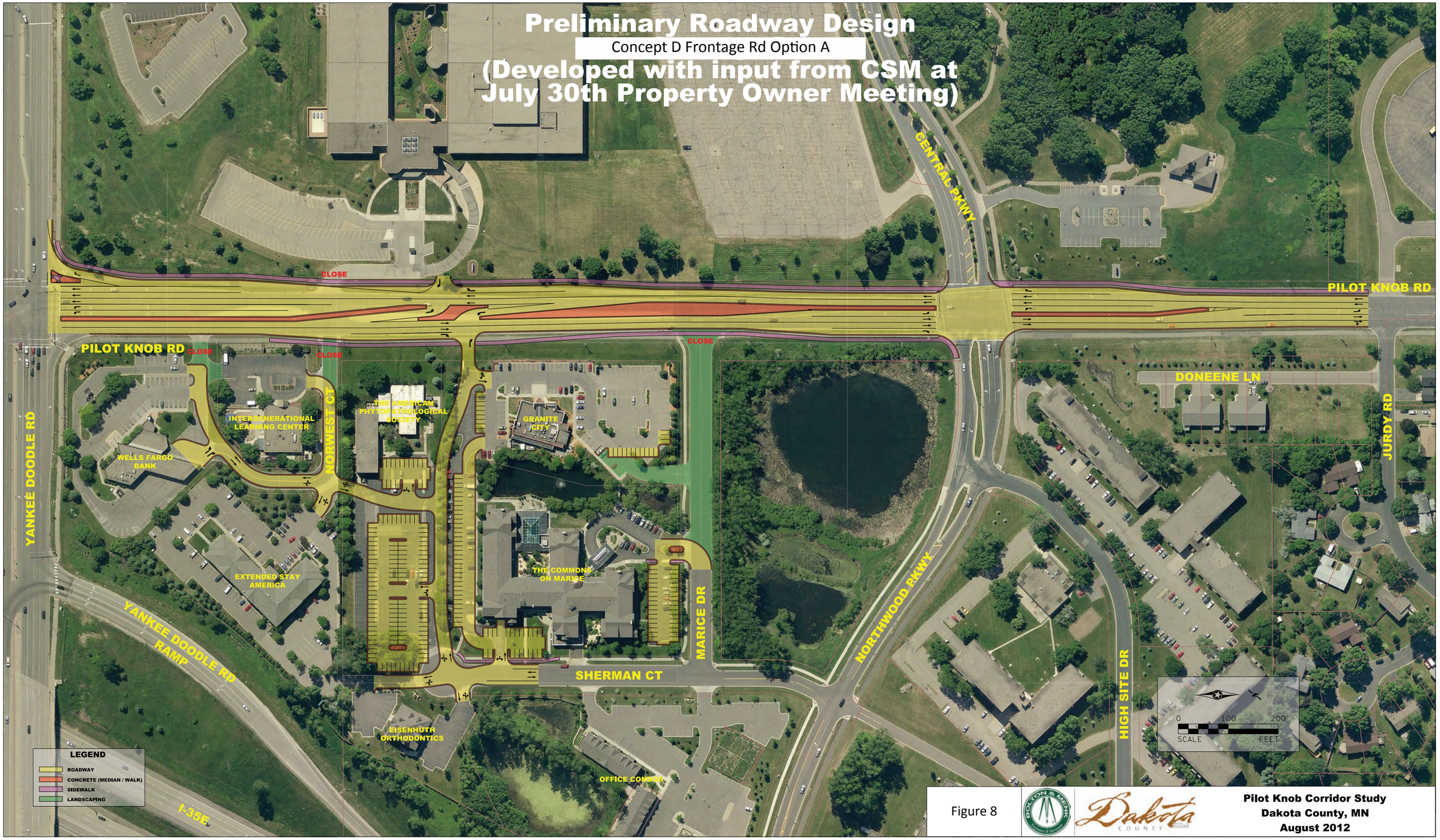

Figure 8

Pilot Knob Corridor Study
Dakota County, MN
August 2012

Preliminary Roadway Design Concept D Frontage Rd Option B

(Developed with input from CSM at July 30th Property Owner Meeting)

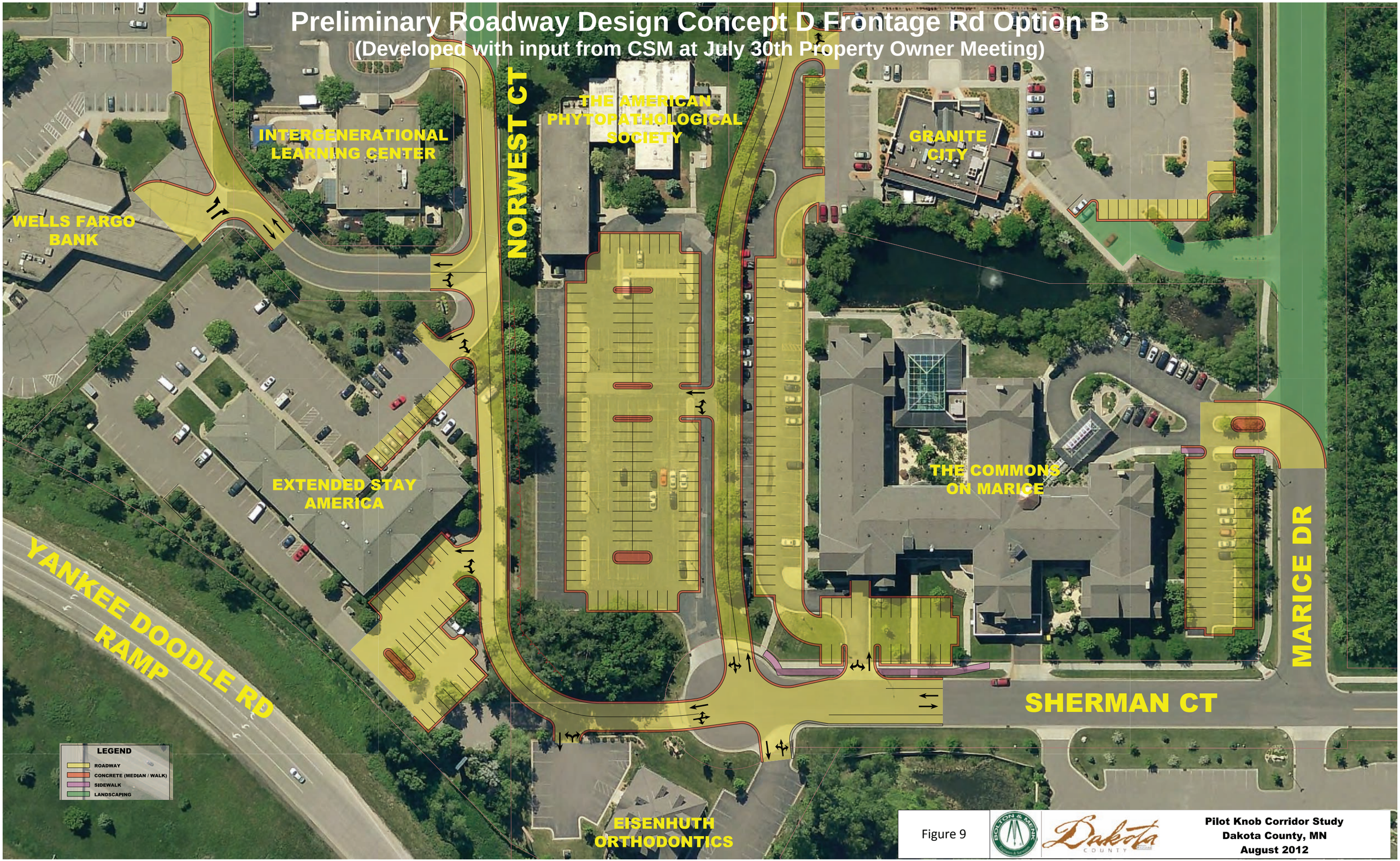

Figure 9

Pilot Knob Corridor Study
Dakota County, MN
August 2012

- Severs American Phytopathological Society parking lot potentially rendering it non-conforming *(Frontage Road Option A)*
- Substantial parking lot reconfiguration to the Commons on Marice and to a lesser extent Granite City *(Frontage Road Option A)*
- Building setback standards at Extended Stay America not met *(Frontage Road Option B)*
- Long circuitous access for businesses near Yankee Doodle Rd *(Frontage Road Option B)*
- Requires dedication of two new local roads to serve this area *(Frontage Road Option B)*
- Substantial parking lot reconfigurations at the Commons on Marice, American Phytopathological Society and Extended Stay America and to a lesser extent Granite City *(Frontage Road Option B)*

CONCEPT EVALUATION

EVALUATION CRITERIA

An evaluation matrix was used to evaluate and compare concepts to one another. The evaluation matrix considered the following factors:

- safety (number of conflict points, collision diagrams, general practices),
- impacts (parcels, full/partial acquisitions, total right-of-way), and
- cost (estimated construction and right-of-way costs).

EVALUATION OF CONCEPTS

The results of the concept evaluation are shown in **Table 1**.

After reviewing the evaluation matrix results, the PMT dismissed Concept D – Frontage Road Options A and B from further consideration. This was based on the high cost of this concept relative to the other concepts. The higher cost for both options of Concept D was directly related to the additional right-of-way acquisitions required to accommodate the local road connections in this concept. The PMT also considered input from the business/property owners within this area (see **Appendix C**) who stated this concept created additional circuity and had a large impact on the existing businesses with little perceived additional benefits. The PMT used this information to support their recommendation to dismiss both options of Concept D.

After dismissing Concept D, the PMT conducted a meeting with City and County staff from other departments (i.e., community development, engineering, etc.) to discuss the remaining concepts (Concepts A, B and C). In order to compare Concepts A, C and B, an analysis comparing intersection traffic control at Pilot Knob Road and Central/Northwood Parkway was completed. The full results of this traffic analysis are included in **Appendix D**. Overall, both the signalized intersection and the roundabout will operate acceptably through 2030 except for the eastbound approach with only one lane eastbound. If the eastbound approach of the roundabout is widened to two lanes and the south side of the roundabout is widened to accept the two lanes eastbound, it is anticipated that the roundabout will function acceptably beyond 2030 with the full development of the former Lockheed Martin site. The roundabout is able to accommodate all vehicles types (i.e., passenger vehicles and large trucks). This does not provide a large benefit in this case since businesses located on the east side of Pilot Knob Road produce mainly vehicular

TABLE 1 – Concept Evaluation

		Concept					
Criteria	**Existing Condition**	**A**	**B**	**C**	**D-Front Rd A**	**D - Front Rd B**	**Preferred Concept**
Number of Conflict Points	45	18	24	18	20	20	24
Parcels Impacted (number of)		6	4	6	5	7	4
Full Acquisitions (number of)		0	0	0	1	0	0
Partial Acquisitions (number of)		6	4	6	4	7	4
Total Right-of-Way (acres of)*		0.31	0.06	0.34	0.52	0.69	0.08
Lineal feet of New Roadway (County)		1,930	2,140	1,930	1,930	1,930	1,930
Lineal Feet of New Roadway (City)		422	0	511	840	1,147	0
Construction Cost Estimate		$2,641,000	$2,702,000	$2,832,000	$2,805,000	$3,035,000	$2,589,000
Right-of-Way Cost Estimate		$698,896	$23,692	$423,162	$4,346,030	$1,359,750	$21,855
Total Cost Estimate*		$4,350,000	$3,760,000	$4,340,000	$8,220,000	$5,550,000	$3,600,000

*Includes project development/delivery costs and contingency

traffic with very few large trucks. Signalized and partial access intersections without opposing lefts can also safely accommodate these vehicular moves along the Pilot Knob Road corridor to serve the east side businesses.

Using this intersection traffic analysis along with the assessment of traffic volume data and the evaluation matrix information, the PMT discussed the benefits and concerns with each of the remaining options (Concept A, B and C). Through this discussion, the PMT dismissed each of the Concepts A, B and C for the following reasons:

1. Concept A (Backage Road Bottom)
    a. Difficult local road connection
        i. High cost and difficulty to determining actual cost due to property impacts
        ii. Challenging terrain
        iii. Business impacts
        iv. Indirect route/low usage
    b. Business concern for need for more than a right-in/right-out at Marice Dr and Norwest Ct

2. Concept B (Roundabout)
    a. Requires additional right-of-way for Pilot Knob Road
    b. Roundabout reduces priority for dominant movements and regional mobility on Pilot Knob Road
    c. Cost

3. Concept C (Backage Road Top)
    a. Difficult local road connection
        i. High cost and difficulty determining actual cost due to property impacts
        ii. Challenging terrain
        iii. Business impacts
        iv. Proximity to hotel
        v. Indirect route/low usage
    b. Lack of business support for right-in/right-out at Marice Dr and Norwest Ct

RECOMMENDED ROADWAY IMPROVEMENT

DRAFT PREFERRED ALTERNATIVE

As discussed in the section above, the study team dismissed each of these concepts and instead developed a new alternative taking some elements of the various original concepts to best meet study objectives. This new alternative met study objectives, addressed traffic and safety needs and responded to property/business owner concerns. Since this new alternative was not presented to the public previously, the PMT agreed to present this new alternative for public review and input. **Figure 10** illustrates the Draft Preferred Alternative and the following summarizes how it addresses purpose and need.

Preliminary Roadway Design

Draft Preferred Alternative

CENTRAL PKWY

PILOT KNOB RD

CLOSE

10:1

15:1

PILOT KNOB RD CLOSE

NORWEST CT

DONEENE LN

JURDY RD

YANKEE DOODLE RD

INTERGENERATIONAL LEARNING CENTER

WELLS FARGO BANK

THE AMERICAN PHYTOPATHOLOGICAL SOCIETY

GRANITE CITY

MARICE DR

EXTENDED STAY AMERICA

THE COMMONS ON MARICE

YANKEE DOODLE RD RAMP

SHERMAN CT

EISENHUTH ORTHODONTICS

OFFICE CONDOS

NORTHWOOD PKWY

HIGH SITE DR

I-35E

LEGEND

- FULL CONSTRUCTION
- MILL AND OVERLAY
- CONCRETE (MEDIAN / WALK)
- BITUMINOUS TRAIL
- SIDEWALK
- LANDSCAPING

0 100 200

SCALE FEET

Pilot Knob Corridor Study
Dakota County, MN
November 2012

FIGURE 10

Purpose and Need Consideration

Operations/Mobility

- Improves safety and mobility by removing two full access intersections and creating two partial accesses (south of Marice Dr on the west side and at Marice Dr on the east side) and one right-in/right-out access (Norwest Ct)
- Queuing from Yankee Doodle Rd would not impact Norwest Ct operations due to the modification of Norwest Ct to right-in /right-out
- All intersections projected to operate safely

Safety

- Right-angle crashes anticipated to decrease at Marice and Norwest due to the elimination of major conflicts at existing full access locations
- Wells Fargo Access Road closure will eliminate crashes and unanticipated stops/slowing at this location and will accommodate right turn lane at Norwest Court
- All accesses have turn lanes to separate turning traffic from thru traffic (improves both safety and mobility)
- Trail on east side of Pilot Knob Road will be relocated further away from roadway for pedestrian safety and comfort between Norwest Ct and Marice Dr
- Shifting the eastbound left turn lane at Central Parkway will provide visibility for opposing left turns and will improve operations and safety

Impacts

- Traffic signal revision at Central Parkway/Northwood Parkway will require widening and addition of a median at this location

DEVELOPMENT OF THE RECOMMENDED CORRIDOR VISION

Following the PMT's identification of the Draft Preferred Alternative, an additional public open house meeting was held to allow business/property owners and interested citizens an opportunity to review and comment on this alternative. Overall, sentiment was favorable for the alternative with the exception of businesses and property owners surrounding the Norwest Ct and Wells Fargo Access Road area. These stakeholders felt strongly that the loss of a southbound left in movement from Pilot Knob Road to Norwest Ct was unacceptable for their businesses, customers and employees. They also felt requiring traffic to utilize U-turns at either the Yankee Doodle Road and/or Central Parkway intersections with Pilot Knob Road was inconvenient and posed safety concerns. Several additional meetings were held with representatives from these businesses to discuss their concerns and to consider modifications to the Draft Preferred Alternative.

While U-turns can be handled safely at the signalized intersections, the Draft Preferred Alternative does require patrons from the north to travel to an indirect route throughout the day. As a means to mitigate the concerns of the surrounding business owners, the County and City developed a Recommended Corridor Plan which provides for a partial access at Norwest Ct, allowing for the southbound left in movement to the surrounding property/business owners. **Figure 11** illustrates the Recommended Corridor Plan. As part of the development of the Recommended Corridor Plan, several analyses were conducted to understand the expected 2030 traffic queues and effects on the proposed intersection areas to ensure adding the southbound left turn could be accommodated while maintaining safety and mobility for the area. The following briefly summarizes each of these analyses conducted in the development of the Recommended Corridor Plan.

Pilot Knob Study
Recommended Corridor Plan

CENTRAL PKWY

SOUTHERN MOST CSM ACCESS

NORTHERN MOST CSM ACCESS

130' MAX

100' MAX

CLOSE

PILOT KNOB RD

CLOSE

PILOT KNOB RD

DONEENE LN

JURDY RD

NORWEST CT

YANKEE DOODLE RD

INTERGENERATIONAL LEARNING CENTER

WELLS FARGO BANK

THE AMERICAN PHYTOPATHOLOGICAL SOCIETY

GRANITE CITY

MARICE DR

EXTENDED STAY AMERICA

THE COMMONS ON MARICE

YANKEE DOODLE RD RAMP

SHERMAN CT

EISENHUTH ORTHODONTICS

OFFICE CONDOS

NORTHWOOD PKWY

HIGH SITE DR

I-35E

LEGEND

- ROADWAY WORK
- CONCRETE (MEDIAN / WALK)
- BITUMINOUS TRAIL
- SIDEWALK
- SHOULDER
- LANDSCAPING
- ADDITIONAL SB THRU LANE
- NEW / REVISED TURN LANE

0 100 200
SCALE FEET

Pilot Knob Corridor Study
Dakota County, MN
December 2012

FIGURE 11

- **Functional Intersection Design (applies to development and modifications of all left turn lanes) -** The Transportation Research Board (TRB) Access Management Manual and the 6th Edition of The Green Book (2011) were referenced to determine functional intersection design of corridor intersections. The Access Management Manual provides tables to determine the lengths recommended to provide adequate distance for motorists to anticipate and react to an upcoming movement or traffic condition (perception-reaction zone) as well as the distance required to decelerate and enter into a queue of stopped vehicles at an intersection (deceleration/maneuver zone). **Figure 12** displays the results of this analysis. The southbound approach of Pilot Knob Road at Yankee Doodle Road is controlled by the thru movement that extends past the turn lane queues and requires drivers to recognize and anticipate the upcoming queued traffic, slow down to an acceptable speed, and join the stopped queue. The goal of the design was to ensure that all deceleration and queuing occurs within the taper and turn lane to limit additional delay to the thru movement. However, in the case of the west side access to the former Lockheed Martin site, the combined turn lane and taper length is able to be shortened, allowing the limits of the proposed Lockheed Martin site access to be shifted south to provide a "window" of acceptable access location to this future development. This is based upon the Access Management Manual's guidance which suggests a 10 mph or less deceleration in the thru lane is acceptable before entering into the taper or turn lane.

- **Assessment of Southbound Left Turn Lane (at Norwest Court) –** An analysis was conducted to consider the anticipated queuing that would occur with the proposed roadway geometry and 2030 PM peak hour traffic volumes. The results of this analysis are shown in **Figure 13**. The initial goal of the Draft Preferred Alternative was to accommodate the maximum queues anticipated to occur on the southbound approach of the Pilot Knob Road at Yankee Doodle Road intersection. The Draft Preferred Alternative included southbound left turn lanes with the necessary length to extend past the projected maximum southbound thru queues to prevent blockages. Because the Recommended Corridor Plan incorporates the southbound left in at Norwest Ct, which shortens the southbound left turn storage area, the average but not maximum southbound thru queues is accommodated.

- **Safety Evaluation –** A safety analysis was conducted to review the existing crash history on Pilot Knob Road between Yankee Doodle Road and Central/Northwood Parkway. Over the past ten years, there have been a total of 353 crashes along the corridor for an average of 35 crashes per year. An analysis of the recommended corridor plan was completed to better understand the safety benefits for the proposed access changes and is included in **Appendix E**.

- **Close Proximity Driveway Analysis –**Based on business feedback, an analysis was conducted to determine the whether or not the Wells Fargo Access Road could remain open with the Recommended Corridor Plan. The analysis concluded there was insufficient distance to provide for reasonable deceleration in the turn lane if the access road remained open. The insufficient deceleration distance in the turn lane triggers a higher speed differential in the thru lanes which is a safety concern for the County and City. Because of this analysis, the County and City agreed the closure of the Wells Fargo Access Road intersection was necessary to maintain safety and mobility along Pilot Knob Road.

- **Parameters for Location of West Side Partial Access –** An analysis was conducted to identify the parameters for west side access to the former Lockheed Martin site based on the Recommended Corridor Plan. The analysis showed the proposed left turn lane length on northbound Pilot Knob Road at the proposed Lockheed Martin site access was developed in

Preliminary Roadway Design

2030 Functional Intersection Design

SOUTHERN MOST CSM ACCESS

NORTHERN MOST CSM ACCESS

130' MAX

100' MAX

CLOSE

CENTRAL PKWY

PILOT KNOB RD

PILOT KNOB RD CLOSE

NORWEST CT

INTERGENERATIONAL LEARNING CENTER

WELLS FARGO BANK

THE AMERICAN PHYTOPATHOLOGICAL SOCIETY

GRANITE CITY

DONEENE LN

JURDY RD

YANKEE DOODLE RD

MARICE DR

EXTENDED STAY AMERICA

THE COMMONS ON MARICE

YANKEE DOODLE RD RAMP

SHERMAN CT

EISENHUTH ORTHODONTICS

OFFICE CONDOS

NORTHWOOD PKWY

HIGH SITE DR

I-35E

LEGEND

- AVERAGE BACK-UP
- DECELERATION/ MANEUVER ZONE
- PERCEPTION-REACTION ZONE

0 100 200

SCALE FEET

Pilot Knob Corridor Study
Dakota County, MN
December 2012

FIGURE 12

Preliminary Roadway Design

Expected 2030 Back-Ups

CENTRAL PKWY

SOUTHERN MOST CSM ACCESS

130'

CLOSE

PILOT KNOB RD

CLOSE

PILOT KNOB RD

DONEENE LN

JURDY RD

NORWEST CT

INTERGENERATIONAL LEARNING CENTER

WELLS FARGO BANK

THE AMERICAN PHYTOPATHOLOGICAL SOCIETY

GRANITE CITY

MARICE DR

YANKEE DOODLE RD

EXTENDED STAY AMERICA

THE COMMONS ON MARICE

YANKEE DOODLE RD RAMP

SHERMAN CT

EISENHUTH ORTHODONTICS

OFFICE CONDOS

NORTHWOOD PKWY

HIGH SITE DR

I-35E

0 100 200

SCALE FEET

LEGEND

AVERAGE BACK-UP

MAXIMUM BACK-UP

Pilot Knob Corridor Study
Dakota County, MN
December 2012

FIGURE 13

addition to the southbound Norwest Ct left turn lane to provide sufficient deceleration length such that no deceleration occurs in the thru lane. Further analysis was conducted to determine the effects of shortening the turn lane length at this location (see **Appendix F**). The analysis concluded the queue storage length and maneuver distance could be shortened so that the former Lockheed Martin site access could be adjusted approximately 130 feet to the south. This would result in some speed differential in the northbound thru lane in this area; however the maximum access adjustment of 130 feet to the south would maintain no greater than a 10 mph speed differential. The TRB Access Management Manual indicates a greater crash potential can be expected with speed differentials greater than 10 mph in this type of condition. Therefore, the Recommended Corridor Plan, as shown in **Figure 11**, includes a "window" of access opportunity to the former Lockheed Martin site, reflective of this turn lane length analysis and desire to maintain a speed differential of 10 mph or less.

IMPLEMENTING THE VISION

The Recommended Corridor Vision shown in **Figure 11** identifies the improvements needed to improve roadway mobility, safety and accommodate existing and planned future land use changes along this segment of Pilot Knob Road. This is a long-term vision that will likely be implemented over time as opportunities present themselves and/or safety issues dictate. Access changes will occur when intersection improvements, including traffic control, are updated and/or changed, when crash problems arise and/or when land use changes are proposed by a property owner. Below is a summary of specific elements of the corridor vision and triggers that would require the implementation of the vision.

- Median and left-turn channelization at Marice, Norwest and Lockheed Martin site access
  - The redevelopment of the former Lockheed Martin Site would require the installation of the median along Pilot Knob Road and left-turn channelization at Marice Dr, Norwest Ct and the Lockheed site access. In addition, redevelopment of this area would also require signal and geometric improvements at the Central/Northwood Parkway intersection with Pilot Knob Road

- Northbound right-turn to Marice Dr and trail improvements
  - These improvements should be implemented with any change in land use along Marice Dr and/or as crash issues arise

- Northbound right-turn to Norwest Ct and closure of Wells Fargo access
  - These improvements should be implemented with any change in land use along Norwest Ct, as crash issues arise and/or with an adjacent improvement project such as capacity improvements at Pilot Knob Rd/Yankee Doodle Rd

The purpose of this long-term corridor vision is to allow the community and property owners the opportunity to work towards the established vision over time.

Appendix A

PROJECT MANAGEMENT TEAM (PMT)

REPRESENTATIVE	AGENCY	TITLE
Kristi Sebastian	Dakota County	Project Manager
Russ Mathys	City of Eagan	Public Works Director
Tim Plath	City of Eagan	Transportation Engineer
Chris Chromy	Bolton & Menk, Inc.	Project Manager
Angie Bersaw	Bolton & Menk, Inc.	Transportation Planner

PMT MEETING SUMMARY

PROJECT MANAGEMENT TEAM MEETING #1
TUESDAY, JUNE 5, 2012: EAGAN CITY HALL

- Review Scope of Work and Schedule
- Discuss Data Needs
- Discuss 1st Stakeholder Meeting

PROJECT MANAGEMENT TEAM MEETING #2
THURSDAY, JUNE 28, 2012: DAKOTA COUNTY WESTERN SERVICE CENTER

- Discuss Existing Conditions Information
- Review July 9th Property Owner Meeting Materials
- Discuss Initial Corridor Concepts

PROJECT MANAGEMENT TEAM MEETING #3
TUESDAY, AUGUST 7, 2012: DAKOTA COUNTY WESTERN SERVICE CENTER

- Review Corridor Improvement Concepts
- Discuss September 5th Open House

PROJECT MANAGEMENT TEAM MEETING #4
SEPTEMBER 11, 2012: EAGAN CITY HALL

- Review Sept 5th Open House Comment Summary
- Discuss Evaluation of Concepts
- Discuss Potential Phasing Opportunities

PROJECT MANAGEMENT TEAM MEETING #5
OCTOBER 9, 2012: EAGAN CITY HALL

- Review Pilot Knob Road Concepts
- Review September 5th Open House Comment Summary
- Discuss Evaluation of Concepts

Appendix B

Attachment B

Pilot Knob Road (CSAH 31) Corridor Study
PUBLIC AND STAKEHOLDER INVOLVEMENT LOG

Meeting Type	Date	Attendees	Meeting Content
Prior to Corridor Study			
CSM Development Discussion Meetings with Dakota County	*September 8, 2011* *September 28, 2011* *December 6, 2011* *January 12, 2011* *March 6, 2012* *March 14, 2012* *Plus email/phone correspondence through process*	*CSM and their Traffic Study Consultants; Dakota County and City of Eagan staff*	*Discuss development plans and evaluation of traffic impacts. (City of Eagan held several other meetings/correspondence with CSM which are not included in this list)*
PILOT KNOB ROAD CORRIDOR STUDY			
Public Open Houses Held By PMT	July 30, 2012	Project Management Team (Dakota County, City of Eagan, Bolton & Menk) and attendees from public/buisnesses.	Study overview, purpose and need for improvements, study area issues map were presented. Received input from attendees.
	September 5, 2012	Project Managment Team (Dakota County, CIty of Eagan, Bolton & Menk representatives), Intergenerational Learning Center, The Commons on Marice, The Goodman Group , Worthington Wellness Center, CSM, HSG Minnesota Inc., Commisioner Egan, citizens	Presented the project need and study information for public review plus 4 concept plans (Concepts A, B C and D). Received input from attendees.
	November 5, 2012	Project Managment Team (Dakota County, CIty of Eagan, Bolton & Menk representatives), The Goodman Group, International Learning Center, Commons on Marice, Wells Fargo, CSM, citizens, Dakota County, City of Eagan and Bolton & Menk. (See Open House Attendee List).	Additional open house added to communicate the Draft Preferred Alternative to the public. Study overview, project need and the Draft Preferred Alternative were presented. Received input from attendees.
Additional Property and Business Owner Meetings to provide information and hear concerns from business reprentatives	June 28, 2012	CSM representatives, Dakota County, City of Eagan	Discussed development plans and access to CSM site.
	October 10, 2012	Dakota County, City of Eagan, Wells Fargo	Reviewed Concepts A-D and Draft Preferred Alternative with Wells Fargo. Listened to concerns and looked for solutions to their access concerns. Bank is concerned with loss of access to Pilot Knob Road and circulation on bank site with only one access to Norwest Court.
	October 25, 2012	City of Eagan and American Phytopathological Society (3340 Pilot Knob Road)	Provide study information and review the concepts under consideration. The property owner expressed support for the Draft Preferred Alternative.
	October 25, 2012	City of Eagan and Extended Stay America	Provide study information and review the concepts under consideration. The hotel representative expressed concern with the impact of loosing a connection to Pilot Knob Road at the Wells Fargo private drive and resulting changes in traffic patterns by the hotel driveway.
	November 2, 2012	Dakota County, City of Eagan, The Goodman Group, The Commons on Marice, RLK Inc., Malkerson Gunn Martin, Bolton & Menk	Reviewed the Draft Preferred Alternative and listened to their concerns related to the loss of southbound left other than a U-turn at Yankee Doodle Road for traffic coming from the north. Property/business owners encouraged the project team to strongly consider some way to continue to provide this southbound left in movement at Norwest Ct.
	November 7, 2012	Dakota County, City of Eagan, Wells Fargo, The Goodman Group	Reviewed the Draft Preferred Alternative and listened to their concerns related to the southbound left from Pilot Knob Road to Norwest Court and loss of access to Wells Fargo private drive. Action: County Project Manager commited to having access reviewed and meet again once assessment was complete.
	December 6, 2012	Dakota County, City of Eagan, Wells Fargo, Extended Stay Hotels, Intergenerational Learning Center, Goodman Group, CSM, Bolton & Menk	Presented a revised Preferred Alternative with a southbound left from Pilot Knob Rd to Norwest Ct. Loss of access to Wells Fargo private drive remain a concern for Wells Fargo.
	December 14, 2012	CSM, Dakota County, City of Eagan, Bolton & Menk	Discussed CSM development plan evolution and developer's concern for a centralized access on Pilot Knob Road (to the extend possible).

Appendix C

PILOT KNOB ROAD (CSAH 31) CORRIDOR STUDY

JULY 30, 2012 STAKEHOLDER MEETING SUMMARY

Eagan Community Center – 2 PM to 5 PM

Purpose

A stakeholder meeting for the Pilot Knob Road (CSAH 31) Corridor Study was held on July 30, 2012 at the Eagan Community Center. The purpose of the meeting was to introduce the study and solicit input on existing issues and needs along Pilot Knob Road.

Meeting Materials

1. Presentation Boards (Study overview, purpose and need, access management overview)
2. Study Overview Handout
3. Comment Forms

Attendees

Three people signed in at the meeting including a Dakota County Commissioner and two representatives from the potential development of the former Lockheed Martin site. City and County project team members were also present.

Comments Received

The following comments were received from representatives of the potential development of the former Lockheed Martin site (CSM):

- Site access (and how it influences site circulation) is a hugely important factor for a viable retail/commercial redevelopment
- Not only number of access points is important, but having a well-designed, prominent and marquee 4-way signalized main entrance helps accomplish the characteristics needed for a successful retail development: ease of access and visibility, sense of arrival, increased ability to attract high-caliber tenants.
- The County has asked CSM to dedicate CSM land to County for future right-of-way improvements
- CSM contribution to off-site improvements
- Strive for balance of objectives/needs from all stakeholders: businesses, land owners, city, county
- Draw on concepts from Eagan's Central Commons Special Area Plan

PILOT KNOB ROAD (CSAH 31) CORRIDOR STUDY

SEPTEMBER 5, 2012 OPEN HOUSE SUMMARY

Eagan Community Center – 3 PM to 6 PM

Purpose

A public open house for the Pilot Knob Road (CSAH 31) Corridor Study was held on September 5, 2012 at the Eagan Community Center. The purpose of the open house was to provide an overview of the purpose of the study, the need for improvements and to solicit public input on the concept alternatives.

Meeting Materials

1. Boards (study overview, need for the study, access management overview, Concepts A, B, C and D)
2. Newsletter Handout
3. Comment Forms

Attendees

Twenty people signed in at the meeting including nearby residents and area businesses and representatives from the potential development of the former Lockheed Martin site. City and County project team members were also present.

Comments Received

Verbal Comments

County, City and consultant staff in attendance reported the following verbal comments from meeting attendees:

Intergenerational Learning Center

- Acknowledged the safety and congestion issues occurring today.
- Daycare children frequently walk to the Commons on Marice. They have been asked not to cross the American Phytopathological Society parking lot and therefore, either use the Extended Stay America lot to Sherman Court or the trail along Pilot Knob Rd.
- Concerned about the loss left-turns in and out of Norwest Ct to their business.
- Felt a local road connection was necessary to provide adequate connectivity if left-turns into and out of Norwest Ct were removed. They seemed to favor Concept A.

- Concerned about additional traffic surrounding the daycare if a local road connection were in place and the Wells Fargo access were closed.
- Improvements should include sidewalks/trails to connect to the existing sidewalk/trail system in this area.

Commons on Marice

- Acknowledged the safety and congestion issues occurring today.
- Commons on Marice favored Concept A (Frontage Road Bottom) since it provided a local road connection to support Pilot Knob Rd and the loss of full access at Norwest Ct and Marice Dr.
- They did not support the Concept D alternatives since they added a roadway closer to their property which they felt was not safe.

Granite City

- Granite City supported Concept B and Concept D, Frontage Road Option B since both of these concepts provided for a southbound left-in for access to their property.
- Granite City currently rents several parking spaces from the American Phytopathological Society for its employees. The restaurant does not support any alternative that would reduce their number of parking stalls since they feel they don't currently have enough.

Office Condo Business (Worthington Wellness Center)

- Liked the idea of the local road connection in Concepts A, C and D since it would bring more traffic by their business.

CSM/Lockheed Site

- Maximum allowable access to the Lockheed site from Pilot Knob is critical to them for commercial development success.
- A centrally located access to the site is favorable.
- The Option D that was developed with CSM "input" removed the most important element of our option: the light and crosswalk. We would not support the option "D" as presented at the meeting as it does not accomplish the CSM goals of providing a marquee entrance with sense of arrival/place, slowing traffic, and allowing for pedestrian connectivity.
- Since the ¾ intersection into our site appears on all options, we don't have a lot of direct input on the access, relative to the choices presented. However, the exact placement of the intersection is important to our project, and creating as much of a marquee entry as possible. It was discussed that the intersection has the ability to slide south. How far? What parameters will influence it's placement?
- The roundabout concept is not supported by CSM due to the following:
    - reduction of pedestrian access/pedestrian barriers from all points at Central and Pilot. Signalized crossings feel better for a connected, multi-modal experience as envisioned by the guiding documents

  - the possibility of losing additional right-of-way to accommodate roundabout (I imagine that Eagan still wants to build trails along Pilot and Central, thus requiring right-of-way in addition to the roundabout right-of-way)
  - the stop light at Central & Pilot Knob allows traffic to stop at doorstep of project to view signage and architectural/gateway features
  - continuous movement along Pilot Knob may negatively influence northbound left into CSM site at ¾ access

General Comments (residents, interested citizens and elected officials)

- Attendees acknowledged the safety and congestion issues occurring today.
- A few attendees expressed support for Concept B (Roundabout) since they felt it addressed safety issues and yet still provided adequate access with the dual partial accesses to both the west and east sides of Pilot Knob Rd.
- A few attendees expressed concern with pedestrian/bicycle mobility and safety with Concept B (Roundabout) due to the high traffic volumes on Pilot Knob. They felt motorists were less likely to yield to pedestrians with a roundabout than a traffic signal.
- One attendee expressed concern with safety and delays at the Pilot Knob Rd/Jurdy Road intersection, just north of the study area.
- A few attendees questioned whether the roundabout will function adequately with high traffic volumes on Pilot Knob Rd.
- One attendee was concerned there would not be adequate gaps in traffic with the roundabout for vehicles at Jurdy Rd to get out onto Pilot Knob?

<u>Written Comments</u>

Below is a summary of the written comments received following this open house:

- Children walk between Intergenerational Daycare and Commons on Marice daily and do not prefer to walk on Pilot Knob Road trail due to its proximity to the road
- Concern with Concept B – will the roundabout be able to handle traffic volumes and how will this impact side street access to the roundabout
- Granite City favors keeping right and left-hand turns into their property off of Pilot Knob Road and does not favor losing any parking spaces
- Appreciates County's progressive approach to transportation issues
- One resident favors the roundabout and closing Marice Drive but notes their concern that Sherman Court and Northwoods Parkway intersection will become a choke point
- Need to balance safety and access and removing full access crossing between Yankee Doodle Rd and Central/Northwoods Parkway in conjunction with a roundabout makes sense

PILOT KNOB ROAD (CSAH 31) CORRIDOR STUDY

NOVEMBER 5, 2012 OPEN HOUSE SUMMARY

Eagan Community Center – 3 PM to 5 PM

Purpose

A public open house for the Pilot Knob Road (CSAH 31) Corridor Study was held on November 5, 2012 at the Eagan Community Center. The purpose of the open house was to solicit public input on the range of improvement concepts and the recommended preferred concept under consideration for the Pilot Knob Road corridor.

Meeting Materials

1. Boards (study overview, need for the study, access management overview, Concepts A, B, C, D and Preferred Concept)
2. Comment Forms

Attendees

Nine people signed in at the meeting including nearby residents and area businesses and representatives from the potential development of the former Lockheed Martin site. City and County project team members were also present.

Comments Received

Verbal Comments

County, City and consultant staff in attendance reported the following verbal comments from meeting attendees:

- Overall, attendee sentiment was favorable for the recommend preferred concept with the exception of the businesses and property owners surrounding Norwest Ct and the Wells Fargo Access Road area. These stakeholders felt strongly the loss of a southbound left in movement from Pilot Knob Road to Norwest Ct was unacceptable for their businesses, customers and employees.
- Stakeholders expressed concerns with requiring traffic to utilize U-turns at either Yankee Doodle Road and/or Central Parkway intersections with Pilot Knob Road. They felt this was inconvenient and could pose safety concerns.

Written Comments

No written comments were received at the open house meeting.

Appendix D

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M E M O R A N D U M

Date: October 15, 2012

To: Kristi Sebastian, P.E., PTOE
Dakota County Project Manager

From: Bryan Nemeth, P.E., PTOE

Subject: Roundabout Operations Analysis
Pilot Knob Road (CSAH 31) Corridor Study

Introduction/Background:

The Pilot Knob Road Corridor Study brought forth an option for a roundabout at the intersection of CSAH 31 (Pilot Knob Road) and Central/Northwood Parkway. To effectively understand the current and forecasted operations of the roundabout and determine if a roundabout at the location is an effective alternative, a traffic analysis was completed. The intersection is located approximately 0.4 miles north of Yankee Doodle Road and 0.6 miles south of Lone Oak Road. The intersection is currently signalized. There is an existing roundabout intersection to the east on Northwood Parkway at Denmark Avenue.

Table 1 includes the current (2011) traffic volumes and 2030 traffic projection. The 2011 volumes do not include any CSM development traffic. The 2030 traffic projection includes the full development of the CSM property to the west of Pilot Knob Road and some regional background growth. The 2030 AADT volumes displayed in Table 1 for Pilot Knob Road, north and south of Central Parkway were evaluated to estimate the fluctuation in traffic volumes between adjoining accesses and side streets. An AADT of 28,000 was attained from the 2030 Dakota County Traffic Model for Pilot Knob Road, north of Yankee Doodle Road. Further to the north, the daily volumes are based on the peak hour volume forecasts obtained from the CSM traffic study. The AADT established for Central parkway in 2030 was estimated by distributing the daily traffic volumes traveling to and from the proposed CSM property via the Central Parkway and Pilot Knob Road intersection, and adding the additional trips to the base 2011 AADT volume.

Table 1: Intersection Traffic Volumes (AADT unless otherwise specified)

Year	Pilot Knob Rd, north of Central Pkwy	Pilot Knob Rd, south of Central Pkwy	Central Pkwy, west of Pilot Knob Rd	Northwood Pkwy, east of Pilot Knob Rd	Total Entering Volume	
					Peak	AADT
2011	16,200	16,200	5,200	4,100	2,180	20,850
2030	26,700	28,000	8,100	6,000	2,920	36,400

* Traffic volume forecasts have a likely confidence range of plus or minus 15%

There is a higher volume of traffic on Pilot Knob Road versus Central/Northwood Parkway. Current (2011) traffic volumes indicate that Pilot Knob Road carries three times more traffic than Central/Northwood Parkway. By 2030, based on expected growth patterns, the traffic volume split is anticipated to stay about the same.

Roundabout Traffic Analysis:

The proposed multi-lane roundabout at the intersection of Pilot Knob Road and Central/Northwood Parkway is designed with an 170' inscribed circular diameter (ICD). The roundabout is anticipated to be two lanes of approach from the north and south and one lane of approach from the east and west. The analysis of the roundabout was completed using both Highway Capacity Manual (HCM) and Rodel operational analysis. The HCM and Rodel methodology is considered to be a fairly conservative analysis of roundabout capacity as the methodology is based on the average capacity. The Rodel analysis assumes a peak 15-minute volume equivalent to a Peak Hour Factor (PHF) of 0.90 and the Confidence Level (CL) was adjusted based on the analysis year. The CL is a measure of driver experience. A higher CL is equivalent to less driver experience with roundabouts which results in lower capacity. Over time, it is likely that the CL will decrease to less than 0.85 and the PHF may also change based on adjacent land uses and regional network changes. For comparison, roundabouts that have been in operation for 10 to 20 years have CL ranges nearer to 0.50. Based on these assumptions, it is likely that the CL can be reduced over time, and consequently the capacity of the roundabout will be higher in 2030 than today.

The 2030 traffic volume assumptions are based off of the CSM site traffic study. The assumptions on traffic growth and distribution coupled with the conservative nature of the roundabout analysis may actually result in better operations than provided below. Additional capacity should be added when needed based on real-world values and analysis, but additional capacity considerations should be taken into account when acquiring right-of-way and design.

Table 2: Roundabout Analysis Level of Service (LOS) Results (2 Lanes N-S, 1 Lane E-W)

Model	CL	Year	Overall	Southbound	Eastbound	Northbound	Westbound
HCM	-	2011	10/A	8/A	20/C	5/A	9/A
	-	2030	48/E	29/D	155/F	7/A	17/C
Rodel	0.85	2011	8/A	4/A	27/C	2/A	7/A
	0.50	2030	43/E	6/A	197/F	2/A	8/A

*Delay/LOS

Current HCM procedure and Rodel analysis with a CL of 0.50 indicates that the multi-lane roundabout as proposed will not operate effectively to 2030 due to the poor service levels for the eastbound approach. This indicates that by 2030, the roundabout may have to be widened to a two-lane eastbound approach (west leg) to provide acceptable operations for all of the approaches during the PM peak hour in 2030 provided that full build of the CSM site as shown in the CSM traffic study is complete. It is anticipated that the roundabout would operate acceptably during the other hours of the day based on the lower traffic volumes.

A widening of the eastbound approach to two lanes (eastbound thru/left lane and eastbound right turn lane) will likely provide additional capacity and provide more acceptable service levels.

Table 3: Roundabout Analysis Level of Service (LOS) Results
(2 Lanes N-S, 1 Lane WB, 1 Thru/Left Lane & 1 Right Turn Lane EB)

Model	CL	Year	Overall	Southbound	Eastbound		Northbound	Westbound
					Left Lane	Right Lane		
HCM	-	2030	27/D	29/D	61/F	12/B	7/A	17/C
Rodel	0.50	2030	12/B	6/A	43/E	8/A	3/A	8/A

*Delay/LOS

Based on the above, an addition of an eastbound right turn lane would be expected to provide operations that are more acceptable. Again, the eastbound approach may be unacceptable during the PM peak hour.

Since traffic volume forecasts have some variability, it may be important to evaluate how the intersection could operate if there was a slight adjustment in traffic distribution leaving the CSM site. If 30% of the left turns generated by the CSM site, exit elsewhere, this results in an overall acceptable operation under both the HCM and Rodel CL 0.50 analysis, with an eastbound right turn lane.

Table 4: Roundabout Analysis Level of Service (LOS) Results
(2 Lanes N-S, 1 Lane WB, 1 Thru/Left Lane & 1 Right Turn Lane EB)

Model	CL	Year	Overall	Southbound	Eastbound		Northbound	Westbound
					Left Lane	Right Lane		
HCM	-	2030	22/C	29/D	30/D	18/C	6/A	15/B
Rodel	0.50	2030	7/A	6/A	17/C	11/B	2/A	7/A

*Delay/LOS

A widening of the eastbound approach and south side of the roundabout to two lanes, to accept the two eastbound lanes into the roundabout, would be expected to increase service levels to acceptable levels, using either HCM or Rodel analysis with a CL of 0.50 as shown in Table 5.

Table 5: Roundabout Analysis Level of Service (LOS) Results (2 Lanes NB, SB, & EB, 1 Lane WB)

Model	CL	Year	Overall	Southbound	Eastbound	Northbound	Westbound
HCM	-	2011	7/A	8/A	7/A	5/A	9/A
	-	2030	20/C	29/D	14/B	7/A	17/C
Rodel	0.85	2011	4/A	4/A	4/A	2/A	7/A
	0.50	2030	6/A	6/A	6/A	3/A	8/A

*Delay/LOS

The roundabout with a two-lane approach from the west, north, and south, and one lane approach from the east would be expected to operate effectively beyond 20 years, for all movements, as shown above. The need for the two-lane approach from the west leg is anticipated to be needed in 10 to 12 years to provide acceptable operations for that approach, based on a straight line growth assumption for all approaches between 2011 and projected 2030 traffic volumes for both Pilot Knob Road and Central/Northwood Parkway. This assumes that the CSM site traffic increase is also developed linearly (full development of the CSM site occurs linearly from 2011 (no build) to 2030 (full build)). This is different from the CSM traffic analysis which assumed full build development by 2015.

Unacceptable delay is only anticipated to be experienced on the eastbound approach during the PM peak hour in 2030 with full build out of the CSM site. This unacceptable delay is based on the CSM site traffic projections and any change in traffic generation or distribution will affect the results. A lower traffic volume leaving the site in the PM peak hour from this intersection, for the eastbound left, would likely provide acceptable operations. During other times of the day, traffic volumes are forecasted to be lower, and delay is anticipated to be acceptable. As stated previously, the HCM and Rodel methodology is considered to be a fairly conservative. Monitoring of real-world conditions may show that higher volumes can be handled acceptably, as is the case in other parts of the United States.

Although the eastbound is unacceptable under some of the alternatives, there are also movements that are expected to fail with a signalized intersection. At a signalized intersection, these are usually lower volume movements such as left turns off of the mainline and cross-street traffic. Since the movements do not come up as often in a traffic signal cycle, the vehicles making those movements may end up waiting for the majority of the cycle length, but when the delay for those few vehicles is balanced against the low delay for the other high volume movements, the overall service levels are deemed as acceptable. The same analogy can be applied to a roundabout, where some movements, in this case eastbound left and through are unacceptable, and overall intersection delay is acceptable.

Traffic Signal Analysis:

A traffic analysis was completed for the intersection to provide a comparison to the roundabout. The intersection was evaluated using Trafficware SimTraffic and uses the same assumptions to those shown in the CSM Corporation traffic analysis. Table 6, below, displays the delay and LOS for the intersection and each individual movement.

Table 6: Traffic Signal Analysis Level of Service (LOS) Results

Year	Overall	Southbound			Eastbound			Northbound			Westbound		
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2011	18/B	22/C	14/B	9/A	50/D	31/C	12/B	24/C	12/B	7/A	39/D	29/C	4/A
2030	36/D	36/D	39/D	18/B	48/D	48/D	13/B	35/C	36/D	25/C	41/D	58/E	9/A

*Delay/LOS

The values shown in Table 6 indicate that the intersection is anticipated to operate at an acceptable level during existing and 2030 conditions, but the individual westbound thru movement may experience unacceptable delay during the 2030 PM Peak hour. Overall, this is considered to be acceptable since the operations of the intersection overall are not compromised. In the event that additional access limitations are imposed south of Pilot Knob Rd at Northwood Pkwy/ Central Pkwy, an alteration in current traffic patterns may cause modifications to the delay and levels of service values reported.

Roundabout Approach Imbalance:

It is recognized that Pilot Knob Road has and is forecasted to have higher volume than Central/Northwood Parkway. While this may be of some concern, the roundabout analysis above indicates that the roundabout would operate acceptably with some lane adjustments as traffic volumes increase, but driver experience will likely increase capacity of the roundabout over time. Currently there are roundabouts throughout the region that are operating acceptably with similar traffic volumes where the mainline has three times the traffic as the side streets. Two of these roundabouts are Diffley Road at Rahn Road in Eagan and 66th Street at Richfield Parkway in Richfield.

Table 7: Traffic Volumes at CSAH 30 (Diffley Road) and Rahn Road:

	Mainline AADT	Side Street 1 AADT	Side Street 2 AADT	Total Entering AADT
Existing (2011)	17,100	5,200	3,050	21,250
Forecasted (2030)	31,700	10,000	4,500	38,950

Table 8: Traffic Volumes at CSAH 53 (66th Street) and Richfield Parkway

	Mainline AADT	Side Street 1 AADT	Side Street 2 AADT	Total Entering AADT
Existing (2011)	13,400	3,600	2,450	16,450
Forecasted (2027)	26,400	10,700	10,700	37,100

Both of the roundabouts have two lanes of approach on the mainline and single lanes of approach from the side streets, except for the southbound movement at 66th/Richfield Pkwy, which is two lanes. Both of these roundabouts operate acceptably today and are anticipated to operate acceptably in the future.

Summary:

The roundabout operations are anticipated to be very similar to a traffic signal based on the analysis. There are unacceptable movements anticipated for both the signal and roundabout designs with the development traffic assumptions. The levels of service (LOS) between a signal and a roundabout are different. LOS D for a signal is up to 55 seconds per vehicles whereas LOS D for a roundabout is up to 35 seconds per vehicle. Ultimately, the roundabout actually results in less delay overall. Figures 1-4 on the following page summarizes the anticipated 2030 LOS and delay at the intersection of Pilot Knob Road and Central Parkway/Northwood Parkway with a signal versus roundabout.

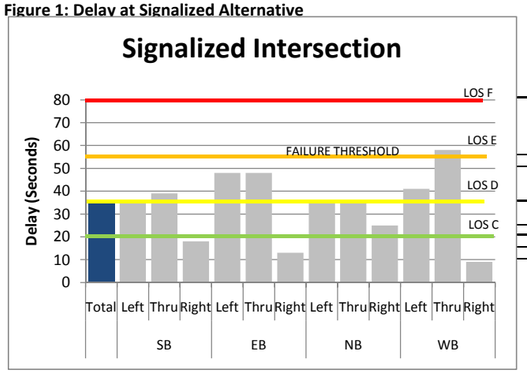
With the roundabout, the low traffic volume on the east and west legs are expected to find adequate gaps in the traffic stream, but the eastbound approach may have some difficulty for part of the PM peak hour in 2030. The eastbound movement will be easiest to make when there is a concurrent vehicle making a movement from the east approach that will stop the heavy southbound movement, i.e. northbound left/u-turn or westbound thru/left. The analysis indicates that the roundabout operations are highly dependent on the traffic projections for the CSM site. The only movement that is expected to have difficulty is the eastbound left, which is highly variable and dependent of the CSM site development traffic forecasts and distribution. Any change in traffic generation or distribution will affect the results. A lower traffic volume leaving the site in the PM peak hour from this intersection, for the eastbound left, would likely provide acceptable operations as shown in the analysis.

Overall, most of the methods indicate that the roundabout will operate acceptably through 2030 except for the eastbound approach with only one lane eastbound. If the eastbound approach of the roundabout is

widened to two lanes and the south side of the roundabout is widened to accept the two lanes eastbound, it is anticipated that the roundabout will function acceptably beyond 2030 with the full development of the CSM site. If an eastbound right turn lane is added to the roundabout instead, all movements of the roundabout are expected to operate acceptably for a longer period of time than just one lane eastbound, but additional expansion may be needed in 10 to 15 years or later, depending on the pace for site development.

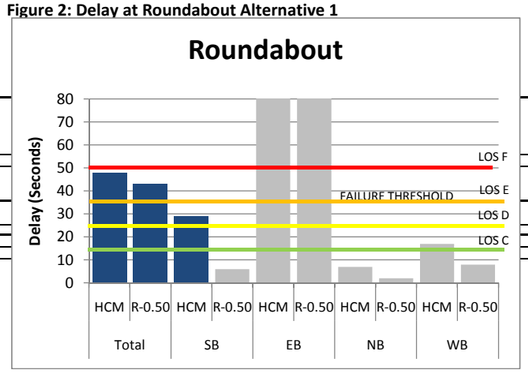
If the alternative with a roundabout is selected it should be a multi-lane roundabout with two lanes N-S and one lane E-W. Future lane expansion to two lanes on the eastbound approach and through the south side of the roundabout should be considered when acquiring right-of-way and placing drainage structures. Expansion of the eastbound approach is expected to be needed based on the rate of development of the CSM site, and actual traffic patterns to and from the CSM development site. The traffic from the CSM site ultimately determines when the eastbound access may need to be widened. As driver experience with roundabouts increases, it is anticipated that the current configuration will operate acceptably for a longer period of time.

Figure 1: Delay at Signalized Alternative



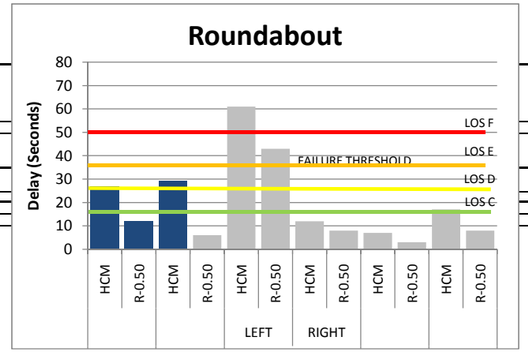
Signalized Intersection Geometry (2030 Traffic Volumes)
Based on Information in Table 6

Figure 2: Delay at Roundabout Alternative 1



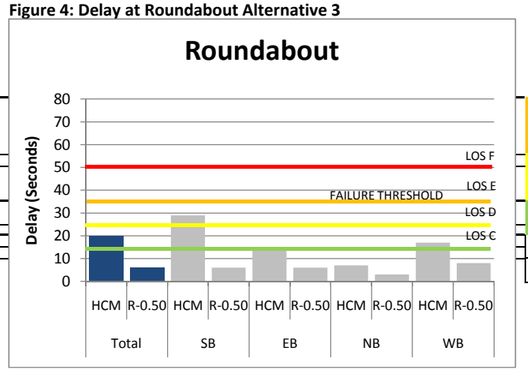
Roundabout Geometry (2030 Traffic Volumes)
2 Lanes North-South, 1 Lane East-West
Based on Information in Table 2

Figure 3: Delay at Roundabout Alternative 2



Roundabout Geometry (2030 Traffic Volumes)
2 Lanes North-South, 1 Lane WB, 1 Thru/Left Lane &
1 Right Turn Lane EB
Based on Information in Table 3

Figure 4: Delay at Roundabout Alternative 3



Roundabout Geometry (2030 Traffic Volumes)
2 Lanes NB, SB, & EB, 1 Lane WB
Based on Information in Table 5

Level of Service (LOS) Key

Signal LOS	Roundabout LOS
LOS E	LOS F
LOS D	LOS E
LOS C	LOS D
LOS B	LOS C
LOS A	LOS B
	LOS A

Appendix A: Operations Analysis Results

2011	vol	lanes	confl. vol	confl. lanes	Capacity	v/c	Delay	LOS
Southbound	1085	2	251	1	1758	0.62	8	A
Eastbound	336	1	1045	2	544	0.62	20	C
Northbound	448	2	384	1	1539	0.29	5	A
Westbound	311	1	491	2	801	0.39	9	A
Overall							10	A

2030	vol	lanes	confl. vol	confl. lanes	Capacity	v/c	Delay	LOS
Southbound	1385	2	430	1	1470	0.94	29	D
Eastbound	575	1	1280	2	461	1.25	155	F
Northbound	500	2	640	1	1192	0.42	7	A
Westbound	455	1	675	2	704	0.65	17	C
Overall							48	E

2EB Lanes of Approach

2011	vol	lanes	confl. vol	confl. lanes	Capacity	v/c	Delay	LOS
Southbound	1085	2	251	1	1758	0.62	8	A
Eastbound	336	2	1045	2	1060	0.32	7	A
Northbound	448	2	384	1	1539	0.29	5	A
Westbound	311	1	491	2	801	0.39	9	A
Overall							7	A

2EB Lanes of Approach

2030	vol	lanes	confl. vol	confl. lanes	Capacity	v/c	Delay	LOS
Southbound	1385	2	430	1	1470	0.94	29	D
Eastbound	575	2	1280	2	894	0.64	14	B
Northbound	500	2	640	1	1192	0.42	7	A
Westbound	455	1	675	2	704	0.65	17	C
Overall							20	C

Add EBR Left/Thru Lane

2030	vol	lanes	confl. vol	confl. lanes	Capacity	v/c	Delay	LOS
Southbound	1385	2	430	1	1470	0.94	29	D
EB T/L	440	1	1280	2	461	0.95	61	F
Northbound	500	2	640	1	1192	0.42	7	A
Westbound	455	1	675	2	704	0.65	17	C

Add EBR Right Lane

2030	vol	lanes	confl. vol	confl. lanes	Capacity	v/c	Delay	LOS
EB R	135	1	1280	2	461	0.29	12	B
Overall							27	D

Traffic Shift with EBR Left/Thru Lane

2030	vol	lanes	confl. vol	confl. lanes	Capacity	v/c	Delay	LOS
Southbound	1385	2	430	1	1470	0.94	29	D
EB T/L	340	1	1280	2	461	0.74	30	D
Northbound	500	2	540	1	1317	0.38	6	A
Westbound	455	1	575	2	756	0.60	15	B

Traffic Shift with EBR Right Lane

2030	vol	lanes	confl. vol	confl. lanes	Capacity	v/c	Delay	LOS
EB R	235	1	1280	2	461	0.51	18	C
Overall							22	C

Roundabout Capacity and Operations Analysis

Pilot Knob Road and Central Parkway/Northwood Parkway

2011

2 Lanes N-S, 1 Lane E-W

Full Intersection Result (CL 0.85)

4:10:12 DACO Pilot Knob/Central Parkway 2011 120											
E (m)	8.00	4.20	8.00	4.20		TIME PERIOD	min	90			
L' (m)	45.72	45.72	45.72	45.72		TIME SLICE	min	15			
V (m)	7.32	3.66	7.32	3.66		RESULTS PERIOD	min	15	75		
RAD (m)	28.96	28.96	28.96	28.96		TIME COST	$/hr	15.00			
PHI (d)	32.00	32.00	32.00	32.00		FLOW PERIOD	min	15	75		
DIA (m)	51.80	51.80	51.80	51.80		FLOW TYPE	pcu/veh	VEH			
GRAD SEP	0	0	0	0		FLOW PEAK	am/op/pm	PM			

LEG NAME	PCU	TURNS (1st exit, 2nd..U)				FLOF	CL	FLOW RATIO			FLOW TIME		
PK SB	1.02	140	781	164	0	1.00	85	0.75	1.125	0.75	15	45	75
Central EB	1.02	116	81	139	0	1.00	85	0.75	1.125	0.75	15	45	75
PK NB	1.02	96	290	62	0	1.00	85	0.75	1.125	0.75	15	45	75
Central WB	1.02	122	89	100	0	1.00	85	0.75	1.125	0.75	15	45	75

FLOW	veh	1085	336	448	311	AVEDEL s	7.7
CAPACITY	veh	1998	502	1900	792	LOS SIG	A
AVE DELAY	secs	3.9	27.2	2.4	7.4	LOS UNSIG	A
MAX DELAY	secs	5.6	48.6	3.2	10.3		
AVE QUEUE	veh	1.2	2.6	0.3	0.7	VEHIC HRS	4.7
MAX QUEUE	veh	1.5	4.2	0.4	0.8	COST $	70

Roundabout Capacity and Operations Analysis

Pilot Knob Road and Central Parkway/Northwood Parkway

2030

2 Lanes N-S, 1 Lane E-W

Full Intersection Result (CL 0.50)

4:10:12		DACO Pilot Knob/Central Parkway 2030								119
E (m)	8.00	4.20	8.00	4.20		TIME PERIOD		min		90
L' (m)	45.72	45.72	45.72	45.72		TIME SLICE		min		15
V (m)	7.32	3.66	7.32	3.66		RESULTS PERIOD		min	15	75
RAD (m)	28.96	28.96	28.96	28.96		TIME COST		$/hr	15.00	
PHI (d)	32.00	32.00	32.00	32.00		FLOW PERIOD		min	15	75
DIA (m)	51.80	51.80	51.80	51.80		FLOW TYPE	pcu/veh		VEH	
GRAD SEP	0	0	0	0		FLOW PEAK	am/op/pm		PM	

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
PK SB	1.02	280 905 200 0	1.00	50	0.75 1.125 0.75	15 45 75
Central EB	1.02	135 155 290 0	1.00	50	0.75 1.125 0.75	15 45 75
PK NB	1.02	115 260 95 30	1.00	50	0.75 1.125 0.75	15 45 75
Central WB	1.02	150 160 145 0	1.00	50	0.75 1.125 0.75	15 45 75

FLOW	veh	1385	580	500	455	AVEDEL s	43.3
CAPACITY	veh	2069	582	1931	908	LOS SIG	D
AVE DELAY	secs	5.5	196.8	2.4	7.8	LOS UNSIG	E
MAX DELAY	secs	8.4	380.6	3.2	11.0		
AVE QUEUE	veh	2.2	36.3	0.4	1.0	VEHIC HRS	35.1
MAX QUEUE	veh	2.9	67.4	0.4	1.3	COST $	527

Roundabout Capacity and Operations Analysis

Pilot Knob Road and Central Parkway/Northwood Parkway

2011

2 Lanes NB, SB, & EB, 1 Lane WB

Full Intersection Result (CL 0.85)

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|                                                                              |
|  4:10:12           DACO Pilot Knob/Central Parkway 2011-2              121   |
|                                                                              |
|------------------------------------------------------------------------------|
|                                                |                             |
| E    (m)    8.00   8.00   8.00   4.20          | TIME PERIOD     min    90   |
| L'   (m)   45.72  45.72  45.72  45.72          | TIME SLICE      min    15   |
| V    (m)    7.32   3.66   7.32   3.66          | RESULTS PERIOD  min 15 75   |
| RAD  (m)   28.96  28.96  28.96  28.96          | TIME COST      $/hr 15.00   |
| PHI  (d)   32.00  32.00  32.00  32.00          | FLOW PERIOD     min 15 75   |
| DIA  (m)   51.80  51.80  51.80  51.80          | FLOW TYPE   pcu/veh   VEH   |
| GRAD SEP       0      0      0      0          | FLOW PEAK  am/op/pm    PM   |
|                                                |                             |
|------------------------------------------------------------------------------|
| LEG NAME |PCU | TURNS (1st exit, 2nd..U)   |FLOF|CL|  FLOW RATIO   |FLOW TIME|
|          |    |                            |    |  |               |         |
|PK SB     |1.02|  140  781  164  0          |1.00|85|0.75 1.125 0.75|15 45 75 |
|Central EB|1.02|  116   81  139  0          |1.00|85|0.75 1.125 0.75|15 45 75 |
|PK NB     |1.02|   96  290   62  0          |1.00|85|0.75 1.125 0.75|15 45 75 |
|Central WB|1.02|  122   89  100  0          |1.00|85|0.75 1.125 0.75|15 45 75 |
|          |    |                            |    |  |               |         |
|          |    |                            |    |  |               |         |
|          |    |                            |    |  |               |         |
|------------------------------------------------------------------------------|
|                                                    |                         |
| FLOW        veh    1085    336    448    311      | AVEDEL  s    4.2    |
| CAPACITY    veh    1998   1176   1900    792      | LOS   SIG      A    |
| AVE DELAY  secs     3.9    4.3    2.4    7.4      | LOS UNSIG      A    |
| MAX DELAY  secs     5.6    6.0    3.2   10.3      |                         |
| AVE QUEUE   veh     1.2    0.4    0.3    0.7      | VEHIC HRS    2.5    |
| MAX QUEUE   veh     1.5    0.5    0.4    0.8      | COST    $     38    |
|                                                    |                         |
--------------------------------------------------------------------------------
```

Roundabout Capacity and Operations Analysis

Pilot Knob Road and Central Parkway/Northwood Parkway

2030

2 Lanes NB, SB, & EB, 1 Lane WB

Full Intersection Result (CL 0.50)

4:10:12			DACO Pilot Knob/Central Parkway 2030-2								122
E	(m)	8.00	8.00	8.00	4.20		TIME PERIOD		min		90
L'	(m)	45.72	45.72	45.72	45.72		TIME SLICE		min		15
V	(m)	7.32	3.66	7.32	3.66		RESULTS PERIOD		min	15	75
RAD	(m)	28.96	28.96	28.96	28.96		TIME COST		$/hr	15	00
PHI	(d)	32.00	32.00	32.00	32.00		FLOW PERIOD		min	15	75
DIA	(m)	51.80	51.80	51.80	51.80		FLOW TYPE	pcu/veh		VEH	
GRAD SEP		0	0	0	0		FLOW PEAK	am/op/pm		PM	

LEG NAME	PCU	TURNS (1st exit, 2nd..U)				CAPF	CL	FLOW RATIO			FLOW TIME		
PK SB	1.02	280	905	200	0	1.00	50	0.75	1.125	0.75	15	45	75
Central EB	1.02	135	155	290	0	1.00	50	0.75	1.125	0.75	15	45	75
PK NB	1.02	115	260	95	30	1.00	50	0.75	1.125	0.75	15	45	75
Central WB	1.02	150	160	145	0	1.00	50	0.75	1.125	0.75	15	45	75

FLOW	veh	1385	580	500	455		AVEDEL	s 5.5
CAPACITY	veh	2069	1218	1910	899		LOS SIG	A
AVE DELAY	secs	5.5	5.8	2.5	8.2		LOS UNSIG	A
MAX DELAY	secs	8.4	8.8	3.4	12.0			
AVE QUEUE	veh	2.2	1.0	0.4	1.1		VEHIC HRS	4.4
MAX QUEUE	veh	2.9	1.3	0.4	1.4		COST	$ 67

Roundabout Capacity and Operations Analysis

Pilot Knob Road and Central Parkway/Northwood Parkway

2030

2 Lanes N-S, 1 Lane WB, 1 Thru/Left Lane & 1 Right Turn Lane EB

NB, SB, WB, and Thru/Left EB Result (CL 0.50)

```
------------------------------------------------------------------------------
|                                                                            |
|  4:10:12          DACO Pilot Knob/Central Parkway F All FR             146  |
|                                                                            |
|----------------------------------------------------------------------------|
|                                                 |                          |
| E    (m)    8.00   4.20   8.00   4.20           | TIME PERIOD     min    90  |
| L'   (m)   45.72  45.72  45.72  45.72           | TIME SLICE      min    15  |
| V    (m)    7.32   3.66   7.32   3.66           | RESULTS PERIOD  min 15 75  |
| RAD  (m)   28.96  28.96  28.96  28.96           | TIME COST      $/hr 15.00  |
| PHI  (d)   32.00  32.00  32.00  32.00           | FLOW PERIOD     min 15 75  |
| DIA  (m)   51.80  51.80  51.80  51.80           | FLOW TYPE   pcu/veh   VEH  |
| GRAD SEP       0      0      0      0           | FLOW PEAK  am/op/pm    PM  |
|                                                 |                          |
|----------------------------------------------------------------------------|
| LEG NAME |PCU | TURNS (1st exit, 2nd..U)    |CAPF|CL|  FLOW RATIO   |FLOW TIME|
|          |    |                             |    |  |               |         |
|PK SB     |1.02|  280  905  200  0           |1.00|50|0.75 1.125 0.75|15 45 75 |
|Central EB|1.02|    0  155  290  0           |1.00|50|0.75 1.125 0.75|15 45 75 |
|PK NB     |1.02|  115  260   95 30           |1.00|50|0.75 1.125 0.75|15 45 75 |
|Central WB|1.02|  150  160  145  0           |1.00|50|0.75 1.125 0.75|15 45 75 |
|          |    |                             |    |  |               |         |
|          |    |                             |    |  |               |         |
|          |    |                             |    |  |               |         |
|----------------------------------------------------------------------------|
|                                                 |                          |
| FLOW        veh    1385    445    500    455   | AVEDEL  s  11.3  |
| CAPACITY    veh    2069    582   1910    899   | LOS   SIG     B  |
| AVE DELAY  secs     5.5   42.7    2.5    8.1   | LOS UNSIG     B  |
| MAX DELAY  secs     8.4   85.8    3.3   11.8   |                          |
| AVE QUEUE   veh     2.2    5.4    0.4    1.1   | VEHIC HRS   8.8  |
| MAX QUEUE   veh     2.9   10.4    0.4    1.4   | COST    $   131  |
|                                                 |                          |
------------------------------------------------------------------------------
```

Roundabout Capacity and Operations Analysis

Pilot Knob Road and Central Parkway/Northwood Parkway

2030

2 Lanes N-S, 1 Lane WB, 1 Thru-Left Lane & 1 Right Turn Lane EB

EB Right Turn Result (CL 0.50)

```
--------------------------------------------------------------------------------
|                                                                              |
|  4:10:12          DACO Pilot Knob/Central Parkway FAllFR R              154  |
|                                                                              |
|------------------------------------------------------------------------------|
|                                                 |                            |
| E    (m)    8.00   4.20   8.00   4.20           | TIME PERIOD     min    90  |
| L'   (m)   45.72  45.72  45.72  45.72           | TIME SLICE      min    15  |
| V    (m)    7.32   3.66   7.32   3.66           | RESULTS PERIOD  min 15 75  |
| RAD  (m)   28.96  28.96  28.96  28.96           | TIME COST      $/hr 15.00  |
| PHI  (d)   32.00  32.00  32.00  32.00           | FLOW PERIOD     min 15 75  |
| DIA  (m)   51.80  51.80  51.80  51.80           | FLOW TYPE   pcu/veh   VEH  |
| GRAD SEP       0      0      0      0           | FLOW PEAK  am/op/pm    PM  |
|                                                 |                            |
|------------------------------------------------------------------------------|
| LEG NAME |PCU | TURNS (1st exit, 2nd..U)    |FLOF|CL|  FLOW RATIO   |FLOW TIME|
|          |    |                             |    |  |               |         |
|PK SB     |1.02|  280  905  200  0           |1.00|50|0.75 1.125 0.75|15 45 75 |
|Central EB|1.02|  135    0    0  0           |1.00|50|0.75 1.125 0.75|15 45 75 |
|PK NB     |1.02|  115  260   95 30           |1.00|50|0.75 1.125 0.75|15 45 75 |
|Central WB|1.02|  150  160  145  0           |1.00|50|0.75 1.125 0.75|15 45 75 |
|          |    |                             |    |  |               |         |
|          |    |                             |    |  |               |         |
|          |    |                             |    |  |               |         |
|------------------------------------------------------------------------------|
|                                                       |                      |
| FLOW        veh    1385    135    500    455         | AVEDEL  s    5.0 |
| CAPACITY    veh    2069    582   2239   1050         | LOS   SIG      A |
| AVE DELAY  secs     5.5    8.2    2.0    6.0         | LOS UNSIG      A |
| MAX DELAY  secs     8.4   11.9    2.6    8.2         |                      |
| AVE QUEUE   veh     2.2    0.3    0.3    0.8         | VEHIC HRS    3.5 |
| MAX QUEUE   veh     2.9    0.4    0.3    0.9         | COST    $     52 |
|                                                       |                      |
--------------------------------------------------------------------------------
```

Roundabout Capacity and Operations Analysis

Pilot Knob Road and Central Parkway/Northwood Parkway

2030, Traffic Redistributed

2 Lanes N-S, 1 Lane WB, 1 Thru/Left Lane & 1 Right Turn Lane EB

NB, SB, WB, and Thru/Left EB Result (CL 0.50)

4:10:12 DACO Pilot Knob/Central Parkway F All FR 152									
E (m)	8.00	4.20	8.00	4.20	TIME PERIOD	min	90		
L' (m)	45.72	45.72	45.72	45.72	TIME SLICE	min	15		
V (m)	7.32	3.66	7.32	3.66	RESULTS PERIOD	min	15	75	
RAD (m)	28.96	28.96	28.96	28.96	TIME COST	$/hr	15.00		
PHI (d)	32.00	32.00	32.00	32.00	FLOW PERIOD	min	15	75	
DIA (m)	51.80	51.80	51.80	51.80	FLOW TYPE	pcu/veh	VEH		
GRAD SEP	0	0	0	0	FLOW PEAK	am/op/pm	PM		

LEG NAME	PCU	TURNS (1st exit, 2nd..U)				FLOF	CL	FLOW RATIO			FLOW TIME		
PK SB	1.02	280	905	200	0	1.00	50	0.75	1.125	0.75	15	45	75
Central EB	1.02	0	150	190	0	1.00	50	0.75	1.125	0.75	15	45	75
PK NB	1.02	115	260	95	30	1.00	50	0.75	1.125	0.75	15	45	75
Central WB	1.02	150	160	145	0	1.00	50	0.75	1.125	0.75	15	45	75

FLOW	veh	1385	340	500	455	AVEDEL	s 6.7
CAPACITY	veh	2069	582	1987	951	LOS SIG	A
AVE DELAY	secs	5.5	17.3	2.4	7.2	LOS UNSIG	A
MAX DELAY	secs	8.4	29.3	3.1	10.3		
AVE QUEUE	veh	2.2	1.7	0.3	0.9	VEHIC HRS	5.0
MAX QUEUE	veh	2.9	2.5	0.4	1.2	COST $	75

Roundabout Capacity and Operations Analysis

Pilot Knob Road and Central Parkway/Northwood Parkway

2030, Traffic Redistributed

2 Lanes N-S, 1 Lane WB, 1 Thru/Left Lane & 1 Right Turn Lane EB

Right Turn Lane EB Result (CL 0.50)

4:10:12 DACO Pilot Knob/Central Parkway FAllFRR2 160										
E (m)	8.00	4.20	8.00	4.20		TIME PERIOD	min	90		
L' (m)	45.72	45.72	45.72	45.72		TIME SLICE	min	15		
V (m)	7.32	3.66	7.32	3.66		RESULTS PERIOD	min	15	75	
RAD (m)	28.96	28.96	28.96	28.96		TIME COST	$/hr	15.00		
PHI (d)	32.00	32.00	32.00	32.00		FLOW PERIOD	min	15	75	
DIA (m)	51.80	51.80	51.80	51.80		FLOW TYPE	pcu/veh	VEH		
GRAD SEP	0	0	0	0		FLOW PEAK	am/op/pm	PM		

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
PK SB	1.02	280 905 200 0	1.00	50	0.75 1.125 0.75	15 45 75
Central EB	1.02	235 0 0 0	1.00	50	0.75 1.125 0.75	15 45 75
PK NB	1.02	115 260 95 30	1.00	50	0.75 1.125 0.75	15 45 75
Central WB	1.02	150 160 145 0	1.00	50	0.75 1.125 0.75	15 45 75

FLOW	veh	1385	235	500	455	AVEDEL s	5.4
CAPACITY	veh	2069	582	2239	1050	LOS SIG	A
AVE DELAY	secs	5.5	10.9	2.0	6.0	LOS UNSIG	A
MAX DELAY	secs	8.4	16.8	2.6	8.2		
AVE QUEUE	veh	2.2	0.7	0.3	0.8	VEHIC HRS	3.9
MAX QUEUE	veh	2.9	1.0	0.3	0.9	COST $	58

25: Northwood Pkwy & Pilot Knob Rd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	1.9	0.7	0.4	1.1	0.8	0.1	0.4	1.0	0.2	1.0	3.1	0.3
Delay / Veh (s)	49.7	31.0	12.1	39.0	29.0	3.7	23.6	12.3	7.0	21.5	14.1	8.6
Vehicles Entered	139	84	114	102	98	124	54	285	89	160	787	136

25: Northwood Pkwy & Pilot Knob Rd Performance by movement

Movement	All
Total Delay (hr)	10.9
Delay / Veh (s)	18.1
Vehicles Entered	2172

25: Northwood Pkwy & Pilot Knob Rd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	3.8	2.1	0.5	1.9	2.7	0.4	0.9	2.4	0.7	1.9	9.6	1.4
Delay / Veh (s)	47.8	47.5	12.7	40.8	58.0	9.4	35.2	35.7	24.6	36.4	38.7	17.8
Vehicles Entered	291	157	139	169	166	143	92	242	108	191	893	276

25: Northwood Pkwy & Pilot Knob Rd Performance by movement

Movement	All
Total Delay (hr)	28.3
Delay / Veh (s)	35.6
Vehicles Entered	2867

Appendix E

BOLTON & MENK, INC.
Consulting Engineers & Surveyors
12224 Nicollet Avenue • Burnsville, MN 55337
Phone (952) 890-0509 • Fax (952) 890-8065
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M E M O R A N D U M

Date: December 3, 2012

To: Kristi Sebastian, P.E., PTOE
Dakota County Project Manager

From: Bryan Nemeth, P.E., PTOE
Christopher S. Chromy, P.E., PTOE

Subject: Safety Evaluation of Access Alternatives
Pilot Knob Road (CSAH 31) Corridor Study

Introduction/Background:

An analysis of the preferred access alternative along CSAH 31/Pilot Knob Road from Yankee Doodle Road to Central/Northwood Parkway was completed to better understand the safety benefits of the proposed access changes. The analysis follows the Highway Safety Manual (HSM) procedures developed by the American Association of State Highway and Transportation Officials (AASHTO) using the crash predictive method for urban and suburban arterials.

There have been a total of 353 crashes along the Pilot Knob Road corridor from Yankee Doodle Road to Central/Northwood Parkway within the last ten years, for an average of 35 crashes per year. This includes the two signalized intersections of Pilot Knob Road with Yankee Doodle Road and Central/Northwood Parkway. A review of the roadway segment, excluding the two signalized intersections, indicates that a total of 33 crashes have occurred in the last ten years, for an average of 3.3 per year.

Highway Safety Manual Analysis:

The HSM provides a science-based technical approach to safety analysis. The procedures are used to estimate crash frequency with a predictive methodology. The procedure outlined in the HSM Part C: Predictive Method was used to predict the crashes at each intersection and along the roadway for each year from today to 2030. The no-build condition is considered to be the same as today, with a four-lane highway, signals at the intersection of Yankee Doodle Road and Central/Northwood Parkway, one right-in/right-out driveway, and two side street stop control intersections at Norwest Court and Marice Drive. The Lockheed Martin drive on the west side of Pilot Knob Road was assumed to remain across from Norwest Court in its current location. Based on these assumptions, it is predicted that there will be a total of 114.9 crashes between 2012 and 2030 and a total of 7.8 crashes in 2030 under the no-build condition.

The corridor study developed and evaluated a number of access alternatives and arrived at a preferred concept. The preferred concept includes access changes along Pilot Knob Road between the signalized intersections at Yankee Doodle Road and Central Parkway/Northwood Parkway, including conversions to three-quarter and right-in/right-out (RIRO) unsignalized intersections. Two ¾ access T-intersections are proposed on Pilot Knob Road, one at Marice Drive and one at the relocated access to the former Lockheed Martin site. Additionally, Norwest Court is proposed to be changed to a RIRO and the driveway to Wells Fargo Bank is proposed to be closed. This scenario results in a reduction of 47 crashes over the next 18 years, a 41% decrease in all crashes.

An additional scenario was identified that would add a southbound left (SBL) at Norwest Court to the preferred option. With the addition of this access, the preferred concept would result in a reduction of 23 crashes over the next 18 years, a 20% decrease in all crashes.

The table below provides a summary of the crash predictions for each scenario.

	Forecasted Crashes		
Scenario	**2030**	**2012 to 2030**	**Change Relative to No-Build**
No-Build	7.8	114.9	-
Preferred	4.8	68.0	41% Decrease
Preferred with SBL at Norwest Ct.	6.3	91.6	20% Decrease

Both scenarios do provide a crash reduction along the corridor, mainly as a result of the decrease in full access intersections at Norwest Court and Marice Drive. The crash prediction methodology indicates that the less access that is provided, the fewer crashes that are likely to occur, resulting in the preferred scenario having a more significant decrease in crash potential.

Appendix F

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M E M O R A N D U M

Date: **December 20, 2012**

To: **Kristi Sebastian, PE, PTOE**
Dakota County

From: **Chris Chromy, PE, PTOE**
Jacob Bongard, EIT
Bolton & Menk, Inc.

Subject: Pilot Knob Corridor Study
CSM Intersection Location
BMI Project No.: T42.105105

I. Introduction

The objective of this technical memorandum is to establish the placement of the proposed CSM access on the segment of Pilot Knob Road between Yankee Doodle Road and Central Parkway/ Northwood Parkway with the December 6 Revised Draft Preferred Alternative (adding in the southbound Norwest Court left turn lane). 2030 queue lengths at the proposed CSM site paired with information from the Transportation Research Board (TRB) Access Management Manual are used as the basis for this analysis.

II. 2030 Build Conditions

An analysis was conducted to evaluate the anticipated queuing that would occur with 2030 PM peak hour traffic volumes on the Revised Draft Preferred Alternative illustrated in Figure 1. Traffic volumes were attained from the *Year 2030 Build Conditions – ¾ Pilot Knob Road Access* figure within the Lockheed Martin Site Redevelopment Traffic Analysis developed for CSM Corporation dated March 13, 2012. Trip redistribution was also performed to better represent the anticipated traffic patterns on the Revised Draft Preferred Alternative.

Trafficware Simtraffic was used to estimate the northbound left-turn lane queue lengths in the 2030 Build PM Peak hour. The additional u-turning vehicles paired with the left-turn movements into the CSM site are anticipated to generate an average queue of approximately 160' during the 2030 Build PM Peak hour. The initial goal of the design shown in Figure 2 was to ensure that all deceleration and queuing occurs within the taper and turn lane to limit additional delay to the thru movement. According to the TRB Access Management manual, a 10 MPH or less deceleration in the thru lane is acceptable before entering into the taper or turn lane. This allows for the combined turn lane and taper length to be shortened, allowing the limits of the proposed CSM access to be shifted south.

Table 1 displays the turn lane + taper length found in the Revised Preferred Alternative as well as the recommended queue length and maneuver distance for existing Pilot Knob roadway

speeds and with a speed reduction of 5 MPH to 20 MPH in the thru lane. The first column represents expected speed differentials with mainline traffic when left turning vehicles depart the thru lane. The third column represents the turn lane and taper length associated with the representative speed differential. The forth column represent how far south the proposed CSM access could be moved relative to the speed differential. As an example, if the driver speed is reduced within the Northbound Pilot Knob Road thru lane by 10 MPH, it would be possible to shift the CSM access 130 feet to the south.

Table 1: Functional Intersection Design

Functional Intersection Design For CSM Northbound-Left Access			
Driver Speed Reduction	Turn Lane + Taper Length	Queue Storage Length + Maneuver Distance	Access Adjustment
0 MPH in Thru Lane	510'	510'	0 Feet South
-5 MPH In Thru Lane		435'	75 Feet South
-10 MPH In Thru Lane		380'	130 Feet South
-15 MPH In Thru Lane		320'	190 Feet South
-20 MPH In Thru Lane		275'	235 Feet South

1. Perception-Reaction distance assumed to occur in thru lane in all scenarios
2. Data attained from TRB Access Management Manual

III. Conclusions and Recommendations

The information put forth in the TRB Access Management Manual indicates that a 10 MPH speed reduction in the thru lanes would be acceptable on Pilot Knob Road. This would allow for a 130' reduction in maneuver distance, which would allow the CSM access to shift further south while still meeting safety objectives. Further shift beyond this southern limit of the proposed access is not recommended.

Preliminary Roadway Design

Preferred Alternative

SOUTHERN MOST CSM ACCESS

NORTHERN MOST CSM ACCESS

130' MAX

100' MAX

CLOSE

CLOSE

10:1

15:1

CENTRAL PKWY

PILOT KNOB RD

PILOT KNOB RD

DONEENE LN

JURDY RD

NORWEST CT

YANKEE DOODLE RD

INTERNATIONAL LEARNING CENTER

WELLS FARGO BANK

THE AMERICAN PHYTOPATHOLOGICAL SOCIETY

GRANITE CITY

MARICE DR

THE COMMONS ON MARICE

EXTENDED STAY AMERICA

YANKEE DOODLE RD RAMP

SHERMAN CT

EISENHUTH ORTHODONTICS

OFFICE CONDOS

NORTHWOOD PKWY

HIGH SITE DR

I-35E

LEGEND

- FULL CONSTRUCTION
- MILL AND OVERLAY
- CONCRETE (MEDIAN / WALK)
- BITUMINOUS TRAIL
- SIDEWALK
- SHOULDER
- LANDSCAPING

0 100 200

SCALE FEET

Pilot Knob Corridor Study
Dakota County, MN
November 2012

FIGURE 1

Preliminary Roadway Design

2030 Functional Intersection Design

SOUTHERN MOST CSM ACCESS

NORTHERN MOST CSM ACCESS

130' MAX

100' MAX

CLOSE

CENTRAL PKWY

PILOT KNOB RD

PILOT KNOB RD CLOSE

NORWEST CT

DONEENE LN

JURDY RD

INTERNATIONAL LEARNING CENTER

THE AMERICAN PHYTOPATHOLOGICAL SOCIETY

GRANITE CITY

WELLS FARGO BANK

MARICE DR

YANKEE DOODLE RD

EXTENDED STAY AMERICA

THE COMMONS ON MARICE

YANKEE DOODLE RD RAMP

SHERMAN CT

HIGH SITE DR

EISENHUTH ORTHODONTICS

OFFICE CONDOS

NORTHWOOD PKWY

I-35E

LEGEND

- AVERAGE BACK-UP
- DECELERATION/ MANEUVER ZONE
- PERCEPTION-REACTION ZONE

0 100 200

SCALE FEET

Pilot Knob Corridor Study
Dakota County, MN
December 2012

FIGURE 2